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ABSTRACT

This study of skill transferability between missile production and nondefense industries provides the necessary data to help formulate retraining and other programs designed to help workers adjust to cutbacks in defense spending. This technical appendix to the project report contains the data upon which the report's conclusions are based. The appendix describes the 127 occupations studied, with or without counterpart occupations in nondefense industries, and includes retraining requirements where applicable. Date is included for defense employment in 1965, and projections are made for employment in counterpart occupations. In addition, the appendix describes the survey methods used, including the questionnaire distributed to employers. Volume I of the report is available as VT 011 092 in this issue. (BH)

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APRIL, 1968

THE POTENTIAL TRANSFER OF INDUSTRIAL SKILLS FROM DEFENSE TO NONDEFENSE INDUSTRIES

Technical Appendix

ACDA/E-102 Volume II

PREPARED FOR

The U.S. Arms Control and Disarmament Agency

PREPARED BY

State of California

Department of Employment

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U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION
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This report was prepared under a contract with the United States Arms Control and Disarmament Agency. The judgments expressed in this report are those of the California Department of Employment, and do not necessarily reflect the views of the United States Arms Control and Disarmament Agency or any other department or agency of the United States Government.

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Technical Appendix A

DEFENSE OCCUPATIONS FOR WHICH DETAILED JOB ANALYSIS SCHEDULES WERE PREPARED, WITH RELATED COUNTERPART OCCUPATIONS RANKED BY LENGTH OF RETRAINING

Of 127 occupations studied, detailed job analysis schedules were prepared for 99 which were selected because they appeared to be unique to defense activities. In the course of analysis, six of these 99 occupations were found to have no identifiable counterpart occupations. Thus 93 occupations are listed in Appendix A, 28 in Appendix B and 6 in Appendix C.

Technical Appendix A lists in alphabetical order, the 93 defense occupations for which counterpart occupations were identified. The corresponding defense occupations are arranged in ascending order according to the length of retraining required to effect a transfer.

There is a total of 534 job combinations identified by full caps, in Appendix A. Because there were instances in which a single occupation was found to be the counterpart of two or more defense occupations, a number of counterpart occupations appear more than once in Appendix A. The total of unduplicated counterpart occupations reflected in Appendix A was 359. Twelve additional counterpart occupations not listed here were identified through job analysis but excluded from Appendix A because for various reasons, employers surveyed indicated that the jobs were not, in fact, comparable to the defense job cited. Had a 100 percent validation been conducted, there likely would have been other exclusions from this appendix.

This appendix differs from Technical Appendix B in that the latter lists occupations not considered to be as exclusively defense-unique as those in Technical Appendix A. Hence, no detailed job analysis schedules were prepared.

EXPLANATION OF ITEMS SHOWN IN TECHNICAL APPENDIX A

Defense Job Title

The plant title of the analyzed defense occupation was used. An asterisk following the defense job title indicates that the job was found at both plants. When the titles were not the same in both plants, the most descriptive title was

selected for use. The first statement following the job title gives an overall summary of the defense occupation. Following the summary statement, the specific duties are identified.

D.O.T. Conversion

When a job in the D.O.T. was found to be identical with the defense occupation in all significant respects, the D.O.T. job title, industry designation, and code have been entered. If no such job could be identified, in the D.O.T., the word "None" followed by a code derived from the analysis of the job duties has been entered. The D.O.T. conversion can be considered the closest counterpart to the defense occupation except when the conversion was found in a defense-oriented industry.

Starting Hourly Wage Rate For Defense Occupation

The starting hourly wages entered are those which were in effect on June 1, 1966.

Counterpart Occupations, D.O.T. Titles

Counterpart occupations of the defense occupation are listed in the left hand column. They are ranked according to the length of training required -- shortest to longest. Where two or more counterpart occupations fall in the same training category, they are listed in the order of D.O.T. code number. In the event of identical code numbers, the entries are arranged alphabetically by industrial designation, and finally the alphabetic order by job title.

D.O.T. Industrial Designation

This column identifies the D.O.T. industrial designation assigned to the definition. Each D.O.T. definition was assigned one or more of these designations for the purpose of indicating the type of economic activity with which the job was associated.

D.O.T. Code

This column identifies the D.O.T. code assigned to the occupation.

Minimum Retraining Requirements

These are the occupational analysts' evaluation of the nature and extent of retraining the defense jobholder must undergo in order to function effectively in the counterpart occupation. Pertinent comments elicited from employers in the course of the survey as to special job knowledge required, license requirements, union and/or company hiring practices, and types of retraining were taken into account. The categories of training time used to rank the counterpart occupations are:

1. No additional training or short demonstration only.

2. Anything beyond short demonstration up to and including 30 days.

3. Over 30 days up to and including 3 months.

4. Over 3 months up to and including 6 months.

Hourly Wage Comparison

An hourly wage comparison was indicated for occupations included in the validation survey. The basis for comparison was the median starting hourly rate derived from employer responses compared to the starting hourly rate paid by the defense plants studied. A spread of up to 5 percent was characterized as "no significant difference". Rates falling outside the 5 percent range were termed as "lower" or "higher", as appropriate.

The information about wage comparisons and job outlook was obtained in the course of the validation survey. "Information Not Available" (INA) identifies the occupations where the employer response was inconclusive. A blank in these two columns indicates that the particular combination was not sampled.

Job Outlook

Each counterpart occupation surveyed was assigned a job outlook rating of "good", "fair", "poor", "indeterminate", or INA. The basis for these ratings was:

1. The response which surveyed employers gave to question number five of the Confidential Employer Validation

Questionnaire, which asks for the employers' estimate of the number of workers they expect to employ in a specific counterpart occupation currently (1966), in 1970, and in 1975, and

2. The employment outlook over the next decade for the primary industry in which that counterpart occupation is most likely to be found.

A "good" rating was assigned to a counterpart occupation only if the aggregate employer response indicated a substantial increase (over the forecast period) in the number of workers they expect to have working in the occupation. In most cases, the rate of increase in employment (over the forecast period) also had to be greater than that of the corresponding primary industry.

A "fair" rating was assigned to a counterpart occupation if responding employers indicated only a moderate over-the-decade increase in employment, or where the rate of increase for the occupation was about the same as for the corresponding primary industry.

A rating of "poor" was assigned to a counterpart occupation if employers said there would be no over-the-decade increase, or an actual decline in the number of persons they expect to employ in that job. In a few cases, the rating of "poor" was assigned when the rate of growth for the occupation fell behind that of its corresponding primary industry.

A rating of "indeterminate" was assigned to counterpart occupations primarily found in a defense-oriented industry, but which would otherwise have been assigned a rating of "good", "fair", or "poor". Appendix G lists all such occupations, and provides a discussion of the employment prospects for the related primary industries.

"INA" (Information Not Available) was assigned to surveyed counterpart occupations for which the data received from employers were too fragmentary to make an assessment of job outlook.

Defense Job Title: ANALYST, MATHEMATICAL

Applies mathematical equations and formulas to solve scientific and engineering problems in missile production and translates mathematical symbology to data processing terminology for computation of data: (1) Identifies and solves problems: Examines sketches, prints, or written instructions to determine type of problems to be solved. Selects mathematical process, such as integration, differentiation, or interpolation, according to type of problem and applying knowledge of mathematics. Selects formulas or equations, or devises equations as required, to solve problems. (2) Prepares data for computer programming: Reviews symbols specified by customers and engineering personnel or confers with computer programming personnel to develop symbology describing mathematical functions and processes. Programs problems, according to knowledge of mathematics, computer language, and equipment characteristics and capacity. Records computer program on standardized forms. Computes data as mathematical model, following steps shown in program, to verify accuracy and completeness of program. (3) Analyzes data: Analyzes data computed by data processing equipment in terms of mathematical procedures and initial problem to determine whether engineering or scientific questions have been answered. Confers with supervisory personnel regarding computed data and modifies equations as directed. Prepares final report of completed project describing mathematical procedures.

D.O.T. Conversion: ENGINEERING ANALYST I (profess. & kin.) 020.088

ANALYST, MATHEMATICAL (Continued)

Starting Hourly Wage Rate For Defense Occupation.....$3.39*

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
MATHEMATICAL TECHNICIAN	(profess. & kin.)	020.188	None	Higher	Indeterminate
			Over 3 months up to and including 6 months		
OPERATIONS-RESEARCH ANALYST	(profess. & kin.)	020.088	Learn to apply concepts to management rather than engineering problems.	Higher	Indeterminate

*Hourly rate converted from monthly salary.

Defense Job Title: ASSEMBLER, GENERAL "A"

Assembles parts of rocket propulsion systems, following blueprints and specifications: (1) Prepares parts for assembly: Slides fingers over metal parts to ascertain smoothness. Removes rough spots with portable power-driven de-burring tool. Positions drilling jig over metal part and drills, reams, and taps holes according to instructions, and using power-driven tools. Measures size of holes with gage. Shapes metal parts following outline of jig, using portable milling cutter. Cleans parts with solvent. (2) Assembles parts, such as mandrels and chambers: Reads blueprints or diagrams to ascertain position and arrangement of parts. Alines parts, such as o-rings, flanges, skirts, manually or using overhead hoists. Screws or bolts parts together, using power driven wrenches and screwdriver. Installs hardware such as mounts, brackets, shims, and stiffeners, using handtools. Brushes adhesive material on specified parts and positions and alines parts for bonding. When assembling mandrel, climbs into missile chamber to perform work. (3) Performs leak checks: Fills holes in parts intended for additional hardware or ports, with plugs with plastic aluminum, preparatory to test. Attaches leak detection fixture to object being tested, such as chamber or hoses, with clamps. Connects hose between leak detection fixture and supply of liquid or gas. Turns handle to open valve, allowing object being tested to fill with specified gas or liquid. Reads pressure meter to ascertain when pressure has reached specified amount. Reads pressure meter at periodic intervals to ascertain whether pressure remains constant or if it drops, indicating presence of leak. Informs designated personnel of leaking assemblies.

D.O.T. Conversion: ASSEMBLER, ROCKET ENGINES (aircraft mfg.) 806.884

ASSEMBLER, GENERAL "A" (Continued)

Starting Hourly Wage Rate For Defense Occupation.....$3.00

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
BOAT OUTFITTER	(ship & boat bldg. & rep.)	806.884	None	Lower	Indeterminate
Plastic Outfitter, Ship	(ship & boat bldg. & rep.)	806.884	None		
Trim Installer	(ship & boat bldg. & rep.)	806.884	None		
Window Installer	(ship & boat bldg. & rep.)	806.884	None		
Wood and Hardware Outfitter	(ship & boat bldg. & rep.)	806.884	None		
			Anything beyond short demonstration up to and including 30 days		
PRESSURE SEALER-AND-TESTER	(aircraft mfg.)	806.884	Learn to use tools, such as calking gun, sealing tool, and heat lamps. One employer indicated a requirement of F.A.A. certification in integral fuel cell scaling and pressure checking.	No Significant Difference	Indeterminate

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Anything beyond short demonstration up to and including 30 days		
AUTOMOBILE-ACCESSORIES INSTALLER	(auto. ser.)	806.884	Learn installation procedures for various products.	Higher	Good
BOAT RIGGER	(ret. tr.)	806.884	Learn installation procedures for each accessory.	Lower	Indeterminate
METAL HANGER	(trans. equip.)	806.884	Become familiar with mobile home structures and frame.	Lower	Good

Defense Job Title: ASSEMBLER, PRECISION AND SHEET METAL

Assembles precision sheet metal missile parts, such as racks, instrument and switch panels, bulkheads, access doors, fairings, support parts, control stands, and main control bracket assemblies, using sheet metal handtools: (1) Lays out work: Reviews production, detail, assembly, installation blueprints, detail assembly tracings, or incomplete documents to ascertain sequence of operations. Measures and marks lines of reference and location points for holes and parts on sheet metal stock, applying knowledge of shop mathematics and layout procedure, and using layout tools, such as scriber, divider, compass, and straightedge. (2) Fabricates assembly hardware: Fabricates such assembly hardware as clips, brackets, shims, and plugs, using riveters, drill press, band and table saws, disc grinder, and sanders. (3) Assembles parts: Reams taper pins and bushings, using reamer. Files and smooths such items as castings, shafts, splines, gears, bushings, bearings, valves, arms, drums, links, and springs to insure specified clearance, using file and crocus cloth, and working to tolerance of ± .015 inches. Mounts and alines items in assembly jigs and fixtures, according to blueprint specifications. Shapes sheet metal parts, using sheet metal handtools, such as hammers, mallets, screwdriver, tinsnips, and pliers. Assembles missile parts, such as racks, bulkheads, and control stands, using hand or machine riveters. Adjusts, and functionally tests operating mechanisms to insure that no interference exists with other systems or parts, such as valves, arms, links, and springs. Inspects assembly to assure conformance to specifications, using precision measuring instruments, such as micrometers, plug gages, scales, and calipers. Confers with company liaison personnel to solve fabrication or assembly problems, as required. Improvises shop aids to facilitate assembly and installation of parts.

D.O.T. Conversion: None 806.381

ASSEMBLER, PRECISION AND SHEET METAL (Continued)

Starting Hourly Wage Rate For Defense Occupation.....$2.98

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 30 days up to and including 3 months		
MAJOR-ASSEMBLY INSPECTOR	(agric. equip.)	806.381	Learn various parts and assemblies of agricultural equipment. Learn to detect rough spots, casting flaws, and scratches.		
ASSEMBLER, AIRCRAFT, STRUCTURES AND SURFACES	(aircraft mfg.)	806.381	Learn assembly sequence and techniques required for aircraft parts.		
ASSEMBLER, ELECTRO-MECHANICAL	(aircraft mfg.)	806.381	Learn to assemble solid fuel powered mechanical and electromechanical devices. Learn to set up and operate electrical, hydraulic, and air test equipment, and to test and calibrate atmospheric pressure switches.		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 30 days up to and including 3 months		
ASSEMBLY MECHANIC, EXPERIMENTAL AIRCRAFT	(aircraft mfg.)	806.381	Learn to assemble and install parts, such as gages, valves, and electrical apparatus.		
INSPECTOR, ASSEMBLIES AND INSTALLATIONS	(aircraft mfg.)	806.381	Learn sequence of assembly and correct assembly techniques in order to inspect aircraft assemblies for conformance to specifications.		
Engine Installation Inspector	(aircraft mfg.)	806.381	" "		
Inspector, Final Assembly	(aircraft mfg.)	806.381	" "		
Inspector, Subassembly	(aircraft mfg.)	806.381	" "		
Inspector, Experimental	(aircraft mfg.)	806.381	" "		
OUTSIDE-PRODUCTION INSPECTOR	(aircraft mfg.)	806.381	Learn specifications for airplane parts being fabricated at a subcontractor's plant. Learn to use hardness tester.		

Defense Job Title: CHEMICAL PLANT OPERATOR "A"

Controls equipment to process chemicals used in the manufacture of solid rocket propellant: (1) Operates equipment, such as reaction kettles, centrifuges, fractionating columns, and pressure, gravity and vacuum filters: Reads work orders to ascertain type and amount of products to be processed. Moves containers of chemicals from stores area to work station, using forklift and hoist. Measures or weighs organic and inorganic chemicals, according to proportions listed in work orders, and using laboratory vessels and precision scales. Dumps chemicals into feed hoppers. Turns knobs, screws, bolts, and handwheels to adjust variables, such as temperature, pressure, and processing time, according to instructions. Opens valves to allow chemicals to flow from feed hoppers to processing chambers. Starts equipment that mixes and compounds chemicals by means of processes, such as boiling, evaporating, extracting, filtering, and fractionating, according to instructions and job knowledge regarding chemical processes and products. Monitors chemical processes by observing measuring instruments, such as dials, and recorders and adjusts equipment to effect chemical reaction, according to production standards. Records readings and adjustments on log. Draws samples of products undergoing synthesis and routes them to laboratory for analysis. (2) Cleans equipment: Purges lines with solvent or detergent. Disassembles equipment, using handtools and swabs parts with cleaning agent. Packs glands of equipment with packing substance under the direction of a superior.

D.O.T. Conversion: CHEMICAL-PLANT OPERATOR (chem.) 559.782

CHEMICAL PLANT OPERATOR "A" (Continued)

Starting Hourly Wage Rate For Defense Occupation.....$3.06

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Anything beyond short demonstration up to and including 30 days		
SPECIALTIES OPERATOR	(chem.)	559.782	Learn to control chemical processing equipment, such as pumps, and agitators to prepare small-lot orders or orders requiring unusually rigid process specifications.	No Significant Difference	Fair
UTILITY OPERATOR	(chem.)	559.782	Learn to operate all types or stills, compressors, reactors, and related chemical process equipment. One responding employer indicates a formal company sponsored training course of up to 6 months.	Higher	Fair
LANOLIN-PLANT OPERATOR	(drug. prep. & rel. prod.)	559.782	Learn to control neutralizers, alcohol recovery stills, vacuum drum driers and filter presses to remove pure lanolin		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Anything beyond short demonstration up to and including 30 days		
LANOLIN-PLANT OPERATOR (Continued)	(drug. Prep. & rel. prod.)	559.782	from wool grease.		
			Over 30 days up to and including 3 months		
ACID-PLANT OPERATOR	(chem.)	559.782	Learn to operate steam generating equipment and generator.		
ALKYLATION OPERATOR	(chem.; petrol. refin.)	559.782	Learn to operate semi-automatic alkylation unit. One employer indicated a company sponsored training course ranging from 6 months to 1 year. Another employer states that union provisions limit promotions to fill openings to company personnel.	Higher	Poor
ALUM-PLANT OPERATOR	(chem.)	559.782	Learn to operate crusher, mill and conveyor and to regulate flow of materials into equipment.		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 30 days up to and including 3 months		
CALCINER OPERATOR I	(chem.)	559.782	Learn to control spray dryer, calciners, coolers and auxiliary equipment.		
CATALYST OPERATOR, GASOLINE	(chem.; petrol. refin.)	559.782	Learn operation of machines that mix ingredients to make catalysts and regulation of flow of materials according to conditions such as temperature and moisture content. One employer states that the union contract provides for promoting workers from within the company to fill job openings. The employer can recruit workers not currently employed by the company only if no qualified workers are available.	Higher	Poor
CRESYLATE OPERATOR II	(chem.)	559.782	Learn to operate continuous flow treating and distilling equipment to produce derivatives from petroleum-refining wastes containing caustic	Higher	INA

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 30 days up to and including 3 months		
CRESYLATE OPERATOR II (Continued)	(chem.)	559.782	cresylates. An employer response indicates formal training courses may be required in the future and there are union restrictions on hiring workers from outside the company.		
ISOBUTYLENE-EXTRACTION OPERATOR	(chem.)	559.782	Learn to control reactors, regenerators, scrubber towers, heat exchangers, vent drums, barometric condensers, and pumps. One employer indicates batch experience not helpful. Experience on continuous process is useful.	INA	INA
MAKE-UP MAN	(chem.)	559.782	Learn to control heaters and agitators to prepare chemical constituents of synthetic rubber.	Lower	Poor
MVA-REACTOR OPERATOR, HEAD	(chem.)	559.782	Learn to control catalytic reactors and auxiliary equipment.	INA	Poor

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 30 days up to and including 3 months		
OPERATOR, GAS ODORANTS	(chem.)	559.782	Learn to control cracking furnace, reaction tower and continuous stills.		
PILOT-CONTROL OPERATOR	(chem.; plastics mat.)	559.782	Learn to set up and operate small scale chemical production equipment under laboratory conditions. Two responding employers indicated a requirement of up to 6 months of formal company training or vocational training course and union restrictions on hiring.	Higher	Fair
SULFIDE OPERATOR	(chem.)	559.782	Learn to control semi-automatic equipment, such as catalytic reactors, stripping columns, and compressors.		
WASTE-TREATMENT OPERATOR	(chem.)	559.782	Learn to control heat exchange unit, pumps, compressors and related equipment. One responding employer indicates a	No Significant Difference	Poor

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 30 days up to and including 3 months		
WASTE-TREATMENT OPERATOR (Continued)	(chem.)	559.782	formal company sponsored training course of up to 6 months.		
ACID MAKER	(paper & pulp)	559.782	Learn operation of rotary or spray sulphur furnaces and adjustment of settings to conform to specified temperature and acidity requirements.		
POLYMER OPERATOR	(synthetic fibres)	559.782	Learn to control high pressure reaction kettles.		
SULFONATOR	(tan. mat. & rel. prod.)	559.782	Learn to control heated agitator vats, pumps, and auxiliary equipment.		

Defense Job Title: CHEMICAL WASTE DISPOSAL MAN

Drives trucks and forklift to transport waste to disposal sites: (1) Collects chemical wastes: Drives truck to designated pickup points. Loads waste on truck, assisted by another worker or using forklift. Drives truck to disposal area and unloads waste at dumping grounds designated according to type of chemical compounds being disposed. Pushes lever in cab of truck to uncouple cab from trailer in case of fire while in transit. (2) Collects septic waste: Drives truck to sump and connects hose between truck and sump, using wrenches. Turns knob to turn on pump that pumps waste from sump to truck. Drives truck to disposal site. Connects hose between truck outlet and disposal outlet. Turns handle to open valve that allows contents to drain by gravity. Cleans truck and hoses by flushing them with water.

D.O.T. Conversion: None 903.883

CHEMICAL WASTE DISPOSAL MAN (Continued)

Starting Hourly Wage Rate For Defense Occupation.....$3.06

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Anything beyond short demonstration up to and including 30 days		
TANK-TRUCK DRIVER	(petrol. refin.; ret. tr., whole. tr.)	903.883	Become familiar with tank truck driving routine. Many responding employers indicate company sponsored training courses ranging in duration from 1 week to 1 month. These courses include safety in handling combustible materials and some sales training. Company union contract may have an effect on job transferability since personnel in lower classes must first be given an opportunity to fill vacant positions before hiring is done from other sources.	No Significant Difference	Good

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Anything beyond short demonstration up to and including 30 days		
LIQUID-FERTILIZER SERVICEMAN	(agric.)	906.883	Learn to synchronize flow of fertilizer with speed of tractor. Learn to inspect and replace hoses and couplings and become familiar with tank truck driving routine. Must learn to calibrate fertilizer injection rigs and improvise.	Lower	Good

Defense Job Title: COMPONENT TEST MECHANIC, SENIOR

Conducts leak, flow, and functional tests of components, subassemblies, and assembled rocket engines: (1) Inspects parts to be assembled: Examines metal parts for burrs and knicks and removes imperfections from parts, using abrasive handtools. (2) Installs fixtures to component, subassembly or assembled engines: Installs plugs and special testing fixtures to parts, such as valves, fuel lines and injection systems to simulate such variables as pressure and flow during firing of engines. Secures fixture and measuring devices to component or subassembly, using marmon clamps, split rings, and bolts. Tightens bolts to specified pressure, using torque wrench. Moves assembly into

burst chamber, using crane overhead hoist. (3) Installs high pressure pipelines between source of gas or water and object to be tested: Reads work orders to determine type of line to be installed. Cuts pipe to length, using pipe cutting machine. Bends pipes to desired configuration, using pipe bending equipment. Installs pipeline and fittings between pumping apparatus and components, using pipefitters' handtools. (4) Conducts pressure, flow, leak detection, and functional tests of components and assemblies: Turns handles to open and close valves in specified sequence to insure that parts function as specified. Turns handles to start pumps that pump nitrogen or water into component. Reads dials indicating pounds of pressure and rate of flow for conformance to specifications and turns handles to regulate pressure or flow, according to job knowledge. Brushes soap over surface of assembly and observes surface for bubbles to detect leaks. Guides halogen leak detection device over surface of assembly and observes indicator on dial to locate escaping freon gas. Conducts functional test of assembled rocket engines by connecting source of fuel substitute (gas and alcohol mixture) to fuel injection system, starting engine, and observing meters that measure performance of hydraulic and mechanical systems. Disassembles engines and subassemblies with handtools. Inspects components visually and measures contours with calipers, micrometers, and gages to determine amount of warpage, distortion, and strain. Analyzes results of tests and records data and analysis of malfunctions on form. (5) Sets up and operates engine lathe to machine fixtures and components: Reads sketches or instructions of fixture to be fabricated or computes dimensions of fixture to be duplicated in enlarged or reduced size, from dimensions of component. Adjusts controls to regulate feed rate, cutting rate, and depth of cut, according to type of metal and configuration of object to be turned. Secures stock in chuck and positions cutting tool in toolholder, using handtools. Starts lathe and turns handwheels to bring workpiece in contact with cutting tool. Measures completed workpiece with micrometer to insure that object conforms to specified dimensions. When machining components, such as valve seats and stems, examines assembly to ascertain causes of faulty fit. Machines parts to obtain better fit, using knowledge of machine set up and parts. (6) Tests testing equipment used in other departments: Places object to be tested, such as calibrated orifice or venturi tube in special testing device. Connects hoses to test object and turns handle to open valve and regulate pressure and flow of water. Reads meters indicating pressure of water flowing through test object. Compares readings with specifications describing desired rate of flow. Computes amount of metal to be removed from orifice to increase flow rate to

COMPONENT TEST MECHANIC, SENIOR (Continued)

specifications, using standardized formulas.

D.O.T. Conversion: ROCKET-ENGINE-COMPONENT MECHANIC (aircraft mfg.) 625.281

Starting Hourly Wage Rate For Defense Occupation.....$3.55

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Anything beyond short demonstration up to and including 30 days		
HYDRAULIC TESTER	(aircraft mfg.; air trans.)	621.281	Learn to operate hydraulic test panel. Some employers require company sponsored training courses ranging from 2 days to 1 month.	No Significant Difference	Good
PNEUMATIC TESTER AND MECHANIC	(aircraft mfg.)	621.381	Learn to operate pneumatic test stand.	Lower	Indeterminate
TESTER, PLUMBING SYSTEMS	(aircraft mfg.)	806.381	Become familiar with aircraft plumbing systems.	INA	INA
Fuel-System Tester	(aircraft mfg.)	806.381	" "		
Oxygen-System Tester	(aircraft mfg.)	806.381	" "		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 30 days up to and including 3 months		
FUEL-INJECTION SERVICEMAN	(any ind.)	625.281	Learn to use testing equipment and techniques of calibration. Railway Industry responding employers all indicate a need for apprentice-ship training program. Some of the remaining responding employers indicate formal company training ranging from 1 month to 2 years.	No Significant Difference	Good
LIFE TESTER, OUTBOARD MOTORS	(engine & turbine)	625.381	Become familiar with outboard motors.		
			Over 3 months up to and including 6 months		
DIESEL-ENGINE TESTER	(engine & turbine)	625.281	Learn to operate generator and motor control panel. Also learn use of precision measuring instruments. Several responding employers indicate a need for vocational or	No Significant Difference	Good

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 3 months up to and including 6 months		
DIESEL-ENGINE TESTER (Continued)	(engine & turbine)	625.281	apprenticeship training ranging from 3 months to a maximum of 2 years.		

Defense Job Title: CONTROL MAN

Operates water purification system to purify water used in testing liquid rocket engines: (1) Operates pumps to purify and circulate water in hydraulics testing laboratory: Turns handles to start motors and open valves to pump water into purification tank. Adds specified amounts of chemicals to tank to form precipitation. Starts agitators in tank to mix chemicals and water. Pumps water, which has passed through purification tank and filtration system, into distribution pipes. Reads dials on control panel that measure variables, such as pressure, temperature, and rate of flow and adjusts controls to assure conformance to specifications. Draws samples from spigots at periodic intervals and compares clarity of water with standard to ascertain rate of sedimentation. Sends samples to laboratory for further analysis. (2) Operates related equipment: Operates pumps to pump cleaning agents through equipment, such as anodizing tanks and chlorothene stills. Pumps waste chemicals into neutralizing tank for processing. Tests acidity of water with pH meter. Adds specified chemicals to neutralize solution. (3) Performs routine maintenance: Cleans purification tank and filters by back-flushing (reversing flow of water). Feels pumps to insure they are not overheating and listens to

CONTROL MAN (Continued)

motors to detect sounds indicating malfunctions. Informs supervisory personnel of equipment malfunctions. (4) Operates forklift to carry bulk chemicals between stores area and work site.

D.O.T. Conversion: WATER-TREATMENT-PLANT OPERATOR (waterworks) 954.782

Starting Hourly Wage Rate For Defense Occupation.....$2.85

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
SEWAGE-PLANT OPERATOR	(any ind.)	954.782	Most responding employers indicate individuals must first pass Civil Service examinations.	Lower	Good
WATER-SERVICE SUPERVISOR	(any ind.)	954.782	Most responding employers indicate individuals must first pass Civil Service examinations.		
			Anything beyond short demonstration up to and including 30 days		
FUEL ATTENDANT	(any ind.)	953.782	Learn safety factors involved in pumping volatile liquids. One	Higher	INA

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Anything beyond short demonstration up to and including 30 days		
FUEL ATTENDANT (Continued)	(any ind.)	953.782	responding employer requires formal company training of 3 weeks.		
PUMP-STATION OPERATOR, WATERWORKS	(water-works)	954.782	Gain knowledge of water consumption cycle. Most responding employers indicate jobs are subject to Civil Service rules and regulations.	Lower	Good
			Over 30 days up to and including 3 months		
PUMPMAN I	(petrol. refin.)	549.782	Learn to maintain equipment, use gaging tape and gain familiarity with refinery. Some responding employers require a company sponsored training course of about 1 month duration. Company union contract may have an effect on job transferability since personnel in lower classes must first be given an opportunity to fill vacant positions	Higher	Poor

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 30 days up to and including 3 mon hs		
PUMPMAN I (Continued)	(petrol. refin.)	549.782	before hiring is done from other sources.	Higher	Poor
GAS-PUMPING-STATION OPERATOR	(light,heat, & power)	953.782	Become familiar with patterns of consumption.	No Significant Difference	Poor
CLARIFYING-PLANT OPERATOR	(textile)	955.782	Learn use of titration equipment and make computation regarding addition of chemicals.		
			Over 3 months up to and including 6 months		
SEWAGE-PLANT OPERATOR	(sanitary ser.)	955.782	Become familiar with load requirements and sewage processing functions. Three responding employers indicate a requirement of a certificate issued by a water pollution control agency. It is obtainable by company sponsored courses, home study courses or vocational schools.		

Defense Job Title: CONTROLS RESEARCH TECHNICIAN, SENIOR

Assembles, tests, and modifies prototype valves and pumps used in rocket propulsion systems: (1) Assembles parts: Confers with engineers regarding methods and procedures for assembling products or reads assembly instructions, sketches, and specifications. Measures parts and compares dimensions with specifications of prototype valves and pumps to which part is to be assembled in order to insure precise fit, using gages, calipers, and micrometers. Assembles parts of prototype valves and pumps in clean room according to knowledge of fabrication techniques, and using handtools. Turns, grinds, and enlarges holes in parts, as required, to obtain precise fit, using handtools and machine tools, such as lathes, grinders, and drill press. Develops simplified techniques of assembling products to be used by production personnel, based on experience with products and tools and knowledge of assembly line processes. (2) Tests components, using hydraulic and pneumatic testing equipment: Confers with engineering personnel or reads specifications to determine product standards. Selects type and sequence of tests and testing equipment to be used, according to knowledge of testing procedures, configuration of part, materials involved, specified standards, and plant safety regulations. Installs plumbing and hoses on testing equipment, using pipe bending tools and handtools to modify fixture to simulate environmental conditions during test. Connects part to be tested to test apparatus using plumbing connections and clamps. Attaches measuring devices, such as flowmeters, and temperature and pressure gages to unit being tested. Connects measuring instruments to electronic recording equipment that records data, such as movement of parts under conditions of varied temperature and pressure. Turns knobs on control panel to open valves and regulate flow of gas or liquid through testing equipment. Varies parameters, such as pressure flow and temperature to determine performance of part under selected conditions. Examines valve for distortion and measures dimensions with precision measuring instruments to determine the effects of testing. Analyzes recorded test results and evaluates product performance according to implications of testing data and product specifications. (3) Modifies original designs and products: Examines unit after test to detect flaws such as distortions or leaks. Analyzes defects to determine improvements to be made. Revises such specifications as size and angle of orifices, considering effect on pressure and flow, and applying prescribed formulas and mathematical procedures. Modifies configuration of product and arrangement of parts, according to knowledge of mechanical systems, and weight and space requirements, and using various machine tools. Submits modified products for approval.

CONTROLS RESEARCH TECHNICIAN, SENIOR (Continued)

D.O.T. Conversion: MECHANICAL ENGINEERING TECHNICIAN (profess. & kin.) 007.181

Starting Hourly Wage Rate For Defense Occupation.....$3.71

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
MECHANICAL-ENGINEERING TECHNICIAN	(profess. & kin.)	007.181	None		

Defense Job Title: DATA REDUCTION SPECIALIST

Applies standardized mathematical formulas to convert rocket firing test data to mathematical form for use by engineering personnel: (1) Selects techniques of data reduction: Reads test requests and confers with engineering personnel to determine scope of problem and test objectives. Analyzes problem to determine type of engineering data required to satisfy test objectives. Studies results of previous tests in form of equations, tables, and graphs to determine methods and procedures used to resolve similar problems. Selects equations, conversion tables, and engineering values to reduce raw data into meaningful forms in terms of project objective, based on factors, such as

DATA REDUCTION SPECIALIST (Continued)

cost, accuracy, time limitations, and characteristics of data processing equipment. Designs new systems of data reduction or modifies existing methods to validate theoretical concepts for which little or no background data is available. Reduces unique mathematical expressions into symbolic computer languages, such as Fortran and Cobal for use by computer programming personnel. (2) Plans factors related to acquisition of data during test firing: Selects analog or digital recording instruments to record results of test according to requirements for continuous or discrete data. Recommends types of thermocouples to be used during test based on factors, such as accuracy, cost, and availability. Confers with establishment or outside personnel to insure that conversion tables are available to convert data collected from thermocouples in terms of millivolts to measuring systems, such as degrees Fahrenheit, and pounds pressure per square inch. (3) Analyzes reduced data for errors: Examines raw data recorded by analog recording instruments and data processed by computer and analyzes factors, such as fit of curves and normality of data sample, according to familiarity with test results and knowledge of data reduction methods. Compares raw data with data in conversion tables to insure that values from specified conversion tables were substituted in computations. Reads computer printout to detect misprint caused by dirt or noise in data processing system. Confers with personnel who calibrate recording instruments to determine reasons for spurious data. Discusses computer programs with technical personnel and recommends changes in programs to improve accuracy or format of data. Designs data reduction methods to circumvent computer programming problems. (4) Computes values used in equations, using calculators and adding machines.

D.O.T. Conversion: MATHEMATICAL TECHNICIAN (profess. & kin.) 020.188

DATA REDUCTION SPECIALIST (Continued)

Starting Hourly Wage Rate For Defense Occupation.....$3.47

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 3 months up to and including 6 months		
WEIGHT ANALYST, AIRCRAFT	(aircraft mfg.)	020.188	Learn weight distribution factors.	Lower	INA

Defense Job Title: DETAIL BENCH ASSEMBLER

Builds detail bench assemblies of missile parts such as panels, access doors, and hydraulic fittings according to detailed assembly blueprints, applying knowledge of missile assembly procedures, and using handtools: (1) Plans work: Reviews production, assembly, and installation blueprints, and other documents, such as photographs, detail assembly tracings, and shop orders to ascertain sequence of operation and methods of assembly, and to select parts for assembly. (2) Assembles parts: Positions parts in assembly and drill jigs and fixtures. Drills, countersinks, and reams holes in parts. Rivets splines and clevises to shafts and rods. Removes excess metal from rivet head, using hand mill. Presses bushings or bearings in place, using arbor press. Inserts spacers and joins parts, such as linkages, arms, rods, levers, and pulley stiffeners. Files parts to meet specified tolerances. (3) Inspects parts: Measures assembled parts

DETAIL BENCH ASSEMBLER (Continued)

to assure conformance to blueprint specifications, using precision measuring instruments, such as micrometers, calipers, and gages. Manually operates mechanical parts to assure freedom of movement. (4) Performs miscellaneous duties: Cleans, lubricates, color codes, and identifies parts, as required. Applies protective coatings to parts prior to wrapping, sealing, and packaging parts for storage or shipment.

D.O.T. Conversion: PRECISION ASSEMBLER, BENCH (aircraft mfg.) 706.781

Starting Hourly Wage Rate For Defense Occupation.....$2.66

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 3 months up to and including 6 months		
INTERNAL-COMBUSTION-ENGINE SUB-ASSEMBLER	(engine & turbine)	706.781	Learn engine assembly techniques and standards.		
Carburetor Assembler	(engine & turbine)	706.781	" "		
Cylinder-Head Assembler	(engine & turbine)	706.781	" "		
Gearcase Assembler	(engine & turbine)	706.781	" "		
Governor Assembler	(engine & turbine)	706.781	" "		
Water Pump Assembler	(engine & turbine)	706.781	" "		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 3 months up to and including 6 months		
ASSEMBLER	(mach. mfg.)	706.781	Learn use of pneumatic tools, bearing alinement, and techniques for assembling heavy machinery.		
Crusher Assembler	(mach. mfg.)	706.781	" "		
Vibrator Assembler	(mach. mfg.)	706.781	" "		

Defense Job Title: ELECTRICAL AND ELECTRONICS INSTALLER

Installs electrical and electronic wiring, and accessories, such as control and instrument panels in missiles and electronic test consoles, according to blueprint, schematic, and wiring chart specifications, applying knowledge of missile electrical and electronic systems and structures, and using handtools: (1) Plans work: Reviews blueprints, schematic drawings, and work order to ascertain sequence of installation. Marks location of accessories, such as junction and switch boxes, and control and instrument panels on missile structure, applying knowledge of missile electrical and electronic systems and mathematics, and using layout tools. (2) Fabricates support items: Fabricates such

ELECTRICAL AND ELECTRONICS INSTALLER (Continued)

sheet metal support items as clips, brackets, and conduit, applying knowledge of sheet metal properties and using handtools, such as shears, saws, and portable drills. (3) Installs wiring, supports, and components, following specifications: Installs support items in missile or missile test console, using handtools, such as screwdriver, hammer, portable drill, and riveter. Installs cables and accessories, such as oscilloscopes, digital counters, power supplies, test console trays, and instruments in missile structure, using handtools. Connects wires to terminals and lugs on missile structure, by reading identifying tags, and using handtools, such as pliers, screwdriver, and soldering gun. (4) Inspects work: Inspects soldering connections to assure conformance to specified standards. Verifies continuity of wiring, using continuity checker or meter.

D.O.T. Conversion: None 829.381

Starting Hourly Wage Rate For Defense Occupation.....$2.98

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Anything beyond short demonstration up to and including 30 days		
WIREMAN, STREET LIGHT	(light, heat, & power.)	821.884	Learn street light wiring techniques and procedures.		
ASSEMBLER, ELECTRICAL	(elec. equip.)	827.884	Learn layout and brazing techniques.		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 30 days up to and including 3 months		
ELECTRICAL-EQUIPMENT TESTER	(aircraft mfg.)	729.381	Learn testing and adjusting electrical equipment and accessories of aircraft.		
WIREMAN, CABLE	(elec. equip.)	729.381	Learn wiring procedures for connecting electrical instruments mounted on control apparatus, such as panel boards and telephone crossbar frames.		
Crossbar-Frame Wireman	(elec. equip.)	729.381	" "		
Crossbar-Unit Wireman	(elec. equip.)	729.381	" "		
Switchboard Assembler	(elec. equip.)	729.381	" "		
CENTRAL-OFFICE INSTALLER	(tel. & tel.)	822.381	Learn techniques of installing telephone equipment used to select, connect and disconnect telephone line.	Lower	Good

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 30 days up to and including 3 months		
CABLE MAN	(tel. & tel.)	822.884	Learn techniques of cutting holes in walls and partitions. Some responding employers indicate a requirement of a company sponsored training course up to 2 weeks in duration. One employer indicated a need for 1 week of training in pole climbing techniques.	Lower	Good
FRAMEMAN	(tel. & tel.)	822.884	Become familiar with distributing frame. Most responding employers indicate formal company training of 8 days. One employer indicates a company sponsored training course of up to 8 weeks.	Lower	Good
PLANT WIREMAN	(tel. & tel.)	822.884	Become familiar with wire distributing frame.		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 30 days up to and including 3 months		
ELECTRICIAN, STUDIO	(motion pic.)	824.884	Become familiar with motion picture electrical sound, lighting, camera, and telephone apparatus.		
CIRCULATING PROCESS INSPECTOR	(elec. equip.)	829.381	Learn to identify defective parts and to use precision measuring instruments, such as dial indicators, micrometers, and calipers.		
			Over 3 months up to and including 6 months		
EQUIPMENT INSTALLER I	(tel. & tel.)	822.381	Learn techniques of installing telegraphic transmitting and receiving equipment.	Lower	INA
EQUIPMENT INSTALLER	(any ind.)	829.381	Learn parts layout.		

Defense Job Title: ELECTRICAL BENCH ASSEMBLER*

Assembles wire harnesses (cables), and solders wires to components used in telemetering systems that control engine functions and guidance systems of missiles. (1) Assembles wire harnesses: Selects wires of color or marking specified in wiring diagram. Cuts wire to specified length, using knife. Positions wires between guide pegs on forming board following colored lines marked on board. Ties wires together with string at specified points to form cables. Tags harnesses with identification labels. (2) Solders wires to components: Reads wiring diagrams to ascertain connections to be made between components, such as instrument regulators, relays, solenoids, plugs, and frames. Strips insulating material from end of wires, and connects them to components, using handtools. Cleans soldering iron with brush and tinning compound. Positions heated soldering iron and resin core solder at points to be joined to melt solder and bond joint. Brushes protective sealing material on joint.

D.O.T. Conversion: ASSEMBLER, ELECTRICAL WIRE GROUP (aircraft mfg.) 728.884

Starting Hourly Wage Rate For Defense Occupation.....$2.76

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
CABLE MAKER	(elec. equip.; electronics)	726.884	One responding employer indicated a 1 week company sponsored training course would be necessary.	Lower	Indeterminate

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
MODULE ASSEMBLER	(electronics)	726.884	One responding employer indicates a 2 week company sponsored training course would be necessary.	Lower	Indeterminate
Hearing-Aid Assembler	(electronics)	726.884	Become familiar with hearing aid assembly.		
PRINTED-CIRCUIT ASSEMBLER	(electronics)	726.884	None	Lower	Indeterminate
ELECTRONICS ASSEMBLER	(inst. & app.)	726.884	One responding employer indicates a 2 week vocational training course would be necessary.	Lower	Indeterminate
WIREWORKER	(electronics)	728.884	None	Lower	INA

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Anything beyond short demonstration up to and including 30 days		
ELECTRICAL-LINE SPLICER	(petrol. production)	728.884	Learn skills for wrapping and unwrapping cables. Learn how to solder butt ends. One responding employer indicates a 2nd class F.C.C. license is required.	INA	Poor

Defense Job Title: ELECTRICAL COMPONENT MOLDER, SENIOR

Encases electrical and electronic parts, such as cables, wires, and connectors used in the circuits of missile systems and test consoles in protective plastics, according to blueprint and process specifications: (1) Plans work: Reviews blueprint and process specifications to ascertain molding methods and sequence of operations. (2) Mixes, pours, and cures compounds: Applies cleaning solvent to parts to remove dust and dirt, using brush. Positions cables, connectors, and wires, having complex and multiple breakouts, bends, and cross-overs in heating molds. Mixes ingredients of resinous compounds applying knowledge of process and formula specifications and molding methods involving electrical and electronic parts, and using mixing container and ladle. Pours resinous compounds over parts in heating molds. Turns on switch to apply heat to mold

ELECTRICAL COMPONENT MOLDER, SENIOR (Continued)

that cures protective compound. (3) Finishes part: Pries cured part from mold after specified time, using screwdriver. Removes flashing and burrs from part, using hand-tools, such as files, knives, scrapers, and sandpaper. Measures part to assure conformance to specifications, using micrometers. (4) Tests parts: Tests continuity, voltage drop, and air pressure, using such test equipment as circuit analyzer, megohmeter, and vacuum chamber.

D.O.T. Conversion: None 556.884

Starting Hourly Wage Rate For Defense Occupation.....$2.85

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Anything beyond short demonstration up to and including 30 days		
RUBBER MOLDER	(model & pattern)	556.884	Learn form stripping and rubber setting properties.		
MOLD-FILLING OPERATOR	(plastics mat.)	556.884	Learn optimum flow rate of solution and to adjust angle of cell to avoid formation of air bubbles.		
SCAGLIOLA MECHANIC	(stat. & art goods)	556.884	Learn finishing techniques for scagliola.		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Anything beyond short demonstration up to and including 30 days		
ISOFORM MIXER	(aircraft mfg.)	559.884	Learn use of electric ovens and propeller molding procedures.		

Defense Job Title: ELECTRICAL MECHANIC

Lays out, assembles, and modifies initial bench layout, complete building, or modification of electrical and electronic missile wiring and accessories or assemblies, such as main junction boxes, test racks, main control switch panels, and instrument and test panels, according to blueprint, schematic drawings, and wire card specifications, and using electricians' handtools: (1) Lays out work: Analyzes blueprints and schematic drawings to determine parts to be used, and to develop sequence of operations and methods of assembly. Measures and marks lines of reference on wood stock to develop wire form boards, using layout tools. (2) Assembles or modifies wiring and components: Builds wire form boards, using handtools. Positions pegs on wire form boards, applying knowledge of electrical and electronic developmental procedures. Measures and cuts wires, applying knowledge of mathematics, and using handtools. Guides cable wires between pegs on form boards forming breakouts. Selects such components as switch, instrument, and test panels, and junction boxes, and locates them on wire form boards, applying basic knowledge of missile electronics systems, and using handtools, such as pliers, screwdriver, and wirecutters. Reworks, removes, or relocates electrical or electronic units, such as

ELECTRICAL MECHANIC (Continued)

switches, relays, solenoids, circuit breakers, instruments, and terminal boards, according to engineering design changes and procedures contained in repair manuals, using handtools. Adds, removes, and reroutes cables and wires, and modifies wire form boards to reflect engineering design changes, applying knowledge of electronics. Solders wires to components and parts, applying knowledge of soldering methods and techniques, and using soldering gun. (3) Inspects parts: Measures completed assembly to assure conformance to specifications, using tape measure and rule. Verifies continuity of wiring, using continuity checker or meter, prior to installation of assembly in missile structure by ELECTRICAL AND ELECTRONIC INSTALLER.

D.O.T. Conversion: ELECTRONICS ASSEMBLER, DEVELOPMENTAL (electronics) 726.281

Starting Hourly Wage Rate For Defense Occupation.....$2.98

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Anything beyond short demonstration up to and including 30 days		
CABLE-LAY-OUT MAN	(elec. equip.)	728.281	Learn layout techniques and procedures.		
			Over 30 days up to and including 3 months		
WIREMAN I	(office mach.)	729.281	Learn to read wiring diagrams, blueprints and engineering specifications on prepunched cards.		

Defense Job Title: ELECTRICAL TECHNICIAN "A"

Installs and tests wiring and electrical devices used in rocket instrumentation and control systems: (1) Installs conduit from blockhouse to circuit junction box: Reads blueprints to determine location, layout, size, and length of conduit to be used. Cuts and shapes conduit according to specifications, using hacksaw and conduit bender. Lays pipe on ground or in underground tunnel as specified. Fits coupling around pipe lengths to be joined and secures coupling with screws and bolts. (2) Installs reduced voltage electrical system between blockhouse and power plant. Pulls wires through conduit, using snake or arranges wires in racks in tunnel according to specified configuration. Ties wires into bundles to form cables and harnesses (a group of wires branching from the trunk) applying knowledge of wiring procedures. Strips insulating material from wires and splices ends of wires with pliers. Solders wire connection. Wraps tape around connection to prevent shorts. Installs control and distribution equipment, such as timers, relay switches, and servo devices, using electrician's handtools. Threads wires in junction box used to connect circuits, applying knowledge of AC and DC circuitry. Connects wires to transducers on power plant and to telemetric instruments following diagrams and using wire connectors. Disconnects and removes temporary wiring at conclusion of test. (3) Test continuity of wiring in propulsion control system: Operates standard testing equipment, such as voltmeters, ammeters, and multimeters to test continuity of circuits. Records results of test on checklist. Locates causes of circuit impedance, applying knowledge of testing instruments and electrical theory. Replaces faulty parts and devices, as required. Modifies wiring for recording instruments as directed. (4) Operates drill press to drill holes in instrument cabinets.

D.O.T. Conversion: ELECTRICIAN (any ind.) 824.281

ELECTRICAL TECHNICIAN "A" (Continued)

Starting Hourly Wage Rate For Defense Occupation.....$3.55

Counterpart - Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 30 days up to and including 3 months		
ELECTRIC-DISTRIBUTION CHECKER	(const.;light, heat,& power)	824.281	Learn construction and building code specifications and learn techniques for examining equipment for conformance to specifications. Most responding employers require formal company training ranging from 2 weeks to 1 year.	Higher	INA
NEON-SIGN SERVICEMAN	(signs)	824.281	Learn how to repair signs including structural fabrication. One responding employer has indicated union contract requires hiring be performed exclusively through union.	Lower	Good

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 30 days up to and including 3 months		
ELECTRICIAN, STAGE	(amuse. & rec.)	824.381	Learn to operate switchboard, position lights, illuminate stage, and follow cue sheets to obtain desired lighting effects. Employer response shows industry highly unionized and hiring would depend upon union specifications.	Lower	INA
STREET-LIGHT SERVICEMAN	(light,heat, & power)	824.381	Learn repair and maintenance of mercury-vapor, fluorescent electric-arc or incandescent street lights and traffic signals. Most responding employers indicate union contract calls for bidding procedures on vacancies occuring in classifications other than entry level. If no company employees are qualified then the company will hire from outside sources.	No Significant Difference	Good

Defense Job Title: ELECTRONICS ASSEMBLER, WELDED MODULES, SENIOR

Assembles modules and subassemblies used in the electrical and electronic circuits of missile systems according to incomplete schematic drawings, using handtools and welding equipment: (1) Plans work: Reviews incomplete wiring diagrams or schematic drawings to ascertain sequence of assembly operations and type of holding fixtures and components to be used. Selects components, such as capacitors, transistors, resistors, condensers, diodes, and transformers, according to information provided in wiring diagrams. (2) Assembles parts: Places module or subassembly in holding fixture. Installs components in module or such subassemblies as modulators, comparators, detectors, bridges, inverters, and amplifiers, applying knowledge of electronics shop practices, and using handtools, such as screwdriver, needle-nose pliers, tweezers, and magnifying glass. Selects electrodes and sets watt-second and electrode pressure on welding equipment, according to weld schedule information. Connects electrodes from welding equipment to component lead wires and circuit board. Moves controls of welding equipment to fuse component lead wire to circuit board by electrical arc. Removes excess lead wire from welded component, using wire cutters. (3) Tests continuity of circuits: Connects wires from such measuring instruments as voltmeters, ammeters, and ohmmeters to component circuits in order to test continuity and to assure conformance with engineering and inspection specifications. (4) Reworks module: Removes solidified plastic and improperly installed components from modules, using handtools, such as scrapers, knives and wire cutters. Modifies components to incorporate changes in engineering design or assembly procedures.

D.O.T. Conversion: MODULE ASSEMBLER (electronics) 726.884

ELECTRONICS ASSEMBLER, WELDED MODULES, SENIOR (Continued)

Starting Hourly Wage Rate For Defense Occupation.....$2.79

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Anything beyond short demonstration up to and including 30 days		
FILTER ASSEMBLER	(electronics)	726.884	Learn color coding and develop soldering skills.		
FORMATION MAN	(electronics)	726.884	Learn use of electrical control panel.		
POTENTIOMETER ASSEMBLER	(electronics)	726.884	Learn use of test equipment and riveting machine.		
ELECTRONICS ASSEMBLER	(inst. & app.)	726.884	Learn color coding and use of power drills and grinder.		
ELECTRICAL-CONTROL ASSEMBLER	(elec. equip.)	729.884	Learn use of staking machine and arbor press.		
Assembler-Communications Equipment	(elec. equip.)	729.884	"	"	
Jack-Strip Assembler	(elec. equip.)	729.884	"	"	

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Anything beyond short demonstration up to and including 30 days		
Relay Assembler	(elec. equip.)	729.884	Learn use of staking machine and arbor press.		
Rheostat-Assembler	(elec. equip.)	729.884	" "		
Speaking-Unit Assembler	(elec. equip.)	729.884	" "		
Switchbox Assembler II	(elec. equip.)	729.884	" "		
Telephone Diaphragm Assembler	(elec. equip.)	729.884	" "		
CHASSIS ASSEMBLER	(electronics)	729.884	Learn use of wire-wrapping and welding devices and location of components.		
Coil Mounter	(electronics)	729.884	" "		
Electronic Assembler, Radio and Television	(electronics)	729.884	" "		
Socket Assembler	(electronics)	729.884	" "		
Transformer Mounter	(electronics)	729.884	" "		
Tube-Cover Mounter	(electronics)	729.884	" "		
Tube-Mounter I	(electronics)	729.884	" "		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Anything beyond short demonstration up to and including 30 days		
Volume Control Mounter	(electronics)	729.884	Learn use of wire-wrapping and welding devices and location of components.		
FARE-REGISTER REPAIRMAN	(motor. trans.)	729.884	Become familiar with mechanical components.		

Defense Job Title: ELECTRONICS MAINTENANCE TECHNICIAN

Installs and maintains a variety of plant electronic equipment used directly or indirectly in the fabrication of missiles: (1) Installs and maintains equipment in offices and plants: Reads work order describing malfunction, or discusses problems with personnel, to determine nature of malfunction. Reads manufacturers' instructions, blueprints, and diagrams to determine type of circuitry and components used in equipment, such as public address systems, intra-establishment transceivers, and amplification systems, in need of repair. Connects test instruments, such as oscilloscopes and function generators to faulty equipment. Analyzes instrument readings to isolate defect, applying knowledge of electronic systems and instrumentation. Disassembles faulty equipment, using handtools. Examines assemblies and components for modifications not recorded in diagrams and analyzes factors, such as type of circuitry and positioning of components to determine reasons for failure. Inspects wiring for broken joints and crossed wires. Tests

ELECTRONICS MAINTENANCE TECHNICIAN (Continued)

continuity of circuit, using such equipment as signal generators, voltmeters, and ammeters. Tests components, such as resistors, capacitors, and transistors, using function generators and oscilloscopes, and studies factors such as input and rise time to determine whether components have maintained specified values. Replaces components, according to knowledge of component characteristics, and using handtools. Replaces wiring as required, according to knowledge of circuitry, and using soldering iron. Modifies systems in accordance with instructions or according to job knowledge by replacing components with those having different values, repositioning components, and altering circuitry to increase efficiency of system. Inspects equipment and performs preventive maintenance. (2) Maintains electronic units used in conjunction with numerically controlled machinery: Discusses with workers, problems concerning operation and functioning of machines to determine type of malfunction. Positions test tape in computer control unit and starts machine. Observes machine and dial indicators on control panel to detect malfunctioning phase according to knowledge of sequence of machine operations. Reads manuals, blueprints and logic diagrams describing internal structures of machine to locate faulty circuitry, applying knowledge of electronic theory and deductive reasoning. Removes printed circuit board from computer and replaces it with duplicate board. Tests components on circuit board with standard electronic testing equipment to determine cause of machine failure. Removes faulty components and solders on replacements. Performs preventive maintenance by testing circuits. Solders components on circuit boards, to be used as replacements, following wiring diagrams.

D.O.T. Conversion: ELECTRONICS MECHANIC (any ind.) 828.281

ELECTRONICS MAINTENANCE TECHNICIAN (Continued)

Starting Hourly Wage Rate For Defense Occupation.....$3.74

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
ELECTRONICS MECHANIC (D.O.T. Conversion)					
Electronics Mechanic Computer	(any ind.)	828.281	Become familiar with computer components.		
Radar Mechanic			Become familiar with radar components.		
			Anything beyond short demonstration up to and including 30 days		
COMMUNICATION ENGINEER	(light,heat, & power)	822.281	Learn radio transmitting and receiving circuitry and clues to malfunctions.		
ELECTRICIAN, RADIO	(any ind.)	823.281	Learn radio transmitting circuitry and clues to malfunction.		
PUBLIC-ADDRESS SERVICEMAN	(any ind.)	823.281	Become familiar with public address system circuitry.		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Anything beyond short demonstration up to and including 30 days		
RADIO MECHANIC II	(any ind.)	823.281	Learn radio transmitting and receiving circuitry and clues to detect malfunction. Most responding employers indicate worker must possess an F.C.C. 2nd class license.		
Radio Mechanic, Ground-Installation	(any ind.)	823.281	" "		
RADIO COMMUNICATIONS EQUIPMENT INSTALLER-SERVICEMAN	(tel. & tel.)	823.281	Learn portable transmitting and receiving circuitry and clues to malfunctioning.		
			Over 30 days up to and including 3 months		
AUTOMATIC-EQUIPMENT TECHNICIAN	(tel. & tel.)	822.281	Learn characteristics of specific equipment being tested.		
CENTRAL-OFFICE REPAIRMAN	(tel. & tel.)	822.281	Learn installation and repair of switching equipment.		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 30 days up to and including 3 months		
METEOROLOGICAL-EQUIPMENT REPAIRER	(any ind.)	823.281	Learn repair of mercurial and aneroid equipment.		
RADIO MECHANIC, AIRCRAFT INSTALLATIONS	(aircraft mfg.; air trans.)	823.281	Learn radio transmitting and receiving circuitry and clues to detect malfunction.		
ELECTRIC-ORGAN TECHNICIAN	(any ind.)	828.281	Become familiar with electric organ circuit diagrams, service manuals, and test equipment.		
COMPONENT-INSPECTION TECHNICIAN	(electronics)	828.281	Become familiar with electronic computer components and sub-assemblies.		
CUSTOMER-ENGINEERING SPECIALIST	(office mach.)	828.281	Become familiar with electronic computer and auxiliary equipment.		
RADIOACTIVITY-INSTRUMENT-MAINTENANCE TECHNICIAN	(petrol. production)	828.281	Become familiar with electrical radioactivity-detecting instruments.		

Defense Job Title: ELECTRONICS MECHANIC-WELDED MODULES

Lays out and assembles developmental and prototype welded modules, used in electrical and electronic circuits of missile systems, to develop production procedures, according to incomplete schematic drawings, and using handtools and welding equipment: (1) Lays out prototype or developmental modules: Reviews incomplete schematic drawings to ascertain sequence of operations. Positions circuit board in holding fixture. Measures and marks location points and lines of reference for miniaturized components, such as capacitors, transistors, diodes, resistors, transformers, and switch relays on modules, applying knowledge of shop mathematics, and using magnifying glass and layout tools, such as scriber, divider, and compass. (2) Assembles prototype or developmental modules: Assembles module, applying knowledge of shop practices and procedures and using welding machine, magnifying glass, and handtools, such as tweezers, pliers, wire cutters, and screwdriver. Reviews manufacturers' process specifications to ascertain type of electrode to be used. Sets and adjusts wattage and electrode pressure on welding machine, according to specifications, in order to obtain desired dimensions, type, and strength of weld. Starts machine and welds component to specified location on module. Cuts excess lead wire from components, using wire cutters. (3) Develops production procedures: Develops assembly methods and sequence, using various combinations of machine settings and electrodes. Records sequence of operations, dial settings on welder, and type of electrode used. Analyzes recorded data to establish production procedures. (4) Tests continuity of circuits: Connects electronic meters, such as ammeter, voltmeter, and ohmmeter to welded components in order to verify their continuity and to assure conformance with engineering and inspection requirements. (5) Modifies and repairs modules: Removes solidified plastic and malfunctioning components from modules, using handtools, such as knives, scrapers, and wire cutters. Replaces component, using welding machine and handtools.

D.O.T. Conversion: ELECTRONICS ASSEMBLER, DEVELOPMENTAL (electronics) 726.281

ELECTRONICS MECHANIC-WELDED MODULES (Continued)

Starting Hourly Wage Rate For Defense Occupation.....$2.98

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
GENERAL ASSEMBLER	(electronics)	726.381	None		
			Over 30 days up to and including 3 months		
HEARING-AID REPAIRMAN	(any ind.)	719.281	Learn use of test instruments.		
INSPECTOR, SYSTEMS	(electronics)	722.281	Learn use of inspection instruments and become familiar with hardware.		
INSPECTOR, GUIDED MISSILES ELECTRONIC SYSTEMS	(gov. ser.)	722.281	Learn use of standard test equipment.		
INSTRUMENT SHOPMAN	(tel. & tel.)	722.281	Become familiar with telecommunications equipment.		
ELECTRICAL-INSTRUMENT REPAIRMAN	(any ind.)	729.281	Learn use of test instruments and test board and develop cutting skills.		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 3 months up to and including 6 months		
ENGINEERING DEVELOPMENT TECHNICIAN	(aircraft mfg.)	726.281	Learn sketching and testing procedures.		
ELECTRONICS TECHNICIAN, AUTOMATED PROCESS	(electronics)	726.281	Learn malfunction isolation techniques and testing procedures.		
AUDIO-VIDEO REPAIRMAN	(any ind.)	729.281	Learn use of test instruments and theory involved in a variety of audio-visual machines.		

Defense Job Title: ELECTRONICS SYSTEMS TECHNICIAN, RESEARCH

Applies electronics theory to develop, test, and evaluate complete prototype of electronic devices used in missiles, working under research laboratory conditions: (1) Plans project: Reads specifications or confers with engineering personnel to determine type of unit to be devised, and various limitations, such as size, weight, performance, accuracy, and prevailing environmental conditions. Develops prototype electronic and

ELECTRONICS SYSTEMS TECHNICIAN, RESEARCH (Continued)

allied systems, such as microwave components, telemetry, guidance, communications, and antennas, applying knowledge of electronic theory and of functions, capacities, and limitations of equipment. (2) Tests prototypes to determine responses and accuracy: Selects type and sequence of tests according to knowledge of test procedures and standards to which system must conform. Selects testing instrumentation, according to knowledge of instrument characteristics. Constructs test circuitry between system being tested and various measuring devices, such as voltmeters and potentiometers, using handtools and clips. Connects power source and recording equipment to unit being tested, using cables, plugs, and leads. Turns on equipment to activate system. Turns knobs to regulate variables, such as voltage, frequence signal, and timing, to test system response to range of conditions. Reads data on dials and scopes during test and records readings on form. (3) Evaluates product performance: Computes information from raw data, using mathematical formulas and equations. Analyzes final data in terms of project specifications to determine whether performance meets standards. Prepares report describing test procedures and product performance to be evaluated by professional personnel. (4) Reworks projects not meeting standards: Troubleshoots system to locate unit or component which prevents system from meeting standards. Substitutes parts having different values or physical characteristics, based on knowledge of electronic systems. Redesigns circuitry, as required. Retests and submits revised product for evaluation. (5) Occasionally fabricates shop aids, such as brackets and holding devices, using saws, lathes, and handtools.

D.O.T. Conversion: ELECTRONIC TECHNICIAN (profess. & kin.) 003.181

ELECTRONICS SYSTEMS TECHNICIAN, RESEARCH (Continued)

Starting Hourly Wage Rate For Defense Occupation.....$3.64

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
ELECTRONIC TECHNICIAN	(D.O.T. Conversion)				
Computer Laboratory Technician	(profess. & kin.)	003.181	Become familiar with computer electronics.		
Development Instrumentation Technician	(profess. & kin.)	003.181	Become familiar with instrumentation electronics.		
Electronic Communication Technician	(profess. & kin.)	003.181	Become familiar with communications electronics.		
Electronic Technician Nuclear Reactor	(profess. & kin.)	003.181	Become familiar with nuclear electronics.		
			Over 30 days up to and including 3 months		
SYSTEMS-TESTING LABORATORY-TECHNICIAN	(profess. & kin.)	003.181	Become oriented with a variety of electrical, hydraulic, or mechanical systems.		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 3 months up to and including 6 months		
INSTRUMENTATION TECHNICIAN	(profess. & kin.)	003.281	Learn operation of testing apparatus and become familiar with sophisticated electronic testing equipment.		

Defense Job Title: ELECTRONIC SYSTEMS RESEARCH TECHNICIAN

Applies electronic theory and principles of electrical circuits and testing techniques to layout, build, test, and modify developmental electronic devices and servo systems used in rocket propulsion systems: (1) Develops experimental electronic devices and servo systems: Confers with engineering personnel and reads schematic drawings, sketches and work orders to determine requirements for electronic devices and systems, such as electronic filters, relays, and transistorized amplifier circuits to be developed. Plans circuitry according to specifications and knowledge of electronic theory, components, and their functions. Selects components according to factors, such as size, weight, and heat resistance and positions them on breadboard, using handtools. Cuts wire for circuitry to size and fastens wire to terminals with clips to form experimental circuits. Plans type and sequence of testing procedures for experimental circuits based on knowledge of capacities of testing equipment and specified standards. Attaches leads between experimental assembly, power source, and testing equipment, such as voltmeters, oscilloscopes,

ELECTRONIC SYSTEMS RESEARCH TECHNICIAN (Continued)

resistance meters, and test bridges to measure parameters such as frequency, voltage, amperage, resistance, and capacitance. Observes dials and graphs on measuring instruments and analyzes results of test to determine whether device meets specifications. Modifies circuits to obtain desired characteristics according to knowledge of electronic theory. (2) Builds prototype electronic devices and servo systems from which production plans will be drafted: Mounts components in container, using scaled-down handtools and following plans adapted from experimental assembly. Selects wire for circuitry according to color coded system and solders wire to components, using miniaturized soldering equipment and resin core solder. Ties wires into cables, using string or tape. Tests completed prototype, following procedures established in testing experimental circuitry. (3) Tests actuators, manufactured by vendors, that control pitch and yaw of rockets: Bolts actuator to fixtures that simulate such conditions as pressure and movement of rocket propulsion system during firing. Places tape on spindle and threads it through tape punching mechanism. Selects sequence, type, and degree of measurement, according to specifications and knowledge of electronic testing procedures. Turns dials and pushes buttons to regulate variables, such as voltage input and frequency. Pushes buttons to punch holes in tape corresponding to equipment settings. Starts equipment to test actuator mounted in fixtures. Reads punched tape or computer print out to determine factors, such as response to varied signal frequencies, and snubbing action (travel) in response to increased voltage in prescribed increments. Evaluates actuator efficiency for conformance to vendor and contract specifications, according to knowledge of electronic theory, product characteristics, and testing apparatus. Prepares report describing test and evaluations.

D.O.T. Conversion: None 003.181

ELECTRONIC SYSTEMS RESEARCH TECHNICIAN (Continued)

Starting Hourly Wage Rate For Defense Occupation.....$3.70

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
ELECTRONIC TECHNICIAN	(profess. & kin.)	003.181	None	Lower	Indeterminate
Computer Laboratory Technician	(profess. & kin.)	003.181	None		
Development Instrumentation Technician	(profess. & kin.)	003.181	None		
Electronic Communications Technician	(profess. & kin.)	003.181	None		
Electronic Technician Nuclear Reactor	(profess. & kin.)	003.181	None		
SYSTEMS-TESTING LABORATORY-TECHNICIAN	(profess. & kin.)	003.181	None		
ELECTRONICS MECHANIC	(any ind.)	828.281	One responding employer indicated a 6 month formal company training course would be necessary.	Lower	Indeterminate

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
Electronics Mechanic, Computer	(any ind.)	828.281	Become familiar with computer components.		
Radar Mechanic	(any ind.)	828.281	Become familiar with radar components.		
			Anything beyond short demonstration up to and including 30 days		
COMPONENT-INSPECTION TECHNICIAN	(electronics)	828.281	Become familiar with electronic computer components.		
CUSTOMER-ENGINEERING SPECIALIST	(office mach.)	828.281	Learn electronic computer and auxiliary equipment installation techniques.		
RADIOACTIVITY-INSTRUMENT-MAINTENANCE-TECHNICIAN	(petrol. production)	828.281	Become familiar with electrical radioactivity testing equipment.		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 30 days up to and including 3 months		
ELECTRICIAN, RESEARCH	(aircraft mfg.)	726.281	Become familiar with aircraft systems. One responding employer indicates worker must possess an F.C.C. 1st class ticket. This is obtainable through a 3 to 6 month vocational course.	No Significant Difference	Indeterminate
ENGINEERING DEVELOPMENT TECHNICIAN	(aircraft mfg.)	726.281	Develop use of drafting tools. One responding employer indicates if applicant is weak in transistor theory an unspecified amount of additional formal training would be necessary.	Lower	Indeterminate
ELECTRIC-ORGAN TECHNICIAN	(any ind.)	823.281	Become familiar with electric organ service manuals.		

Defense Job Title: ELECTRONIC SYSTEMS RESEARCH TECHNICIAN (COMPUTERS)

Maintains and repairs digital and analog computers used to record data during static testing of rocket propulsion systems: (1) Troubleshoots computers: Reviews work order or confers with workers to obtain description of malfunction and analyzes logic-block diagrams in equipment maintenance manuals to localize problem area. Removes amplifier from chassis, using handtools. Measures bandwidth, noise level, wave distortion, overload, and time and frequency using electronic testing equipment, such as R F audio generators, oscilloscopes, signal generators, and vacuum tube voltmeters. Measures functions, on digital computer system, such as gating and timing networks, multi-vibration systems, pulse timing, pulse width, and pulse amplitude, using pulse generators, dual trace oscilloscopes, digital ohmmeters and voltmeters, and counters, designed to measure high-speed, high-frequency events. Analyzes measurements on dials and graphs to locate or verify malfunctions according to knowledge of electronic theory, testing procedures, and specific computer equipment. Removes tape transports, rollers, and speed and drive mechanisms from cabinet. Measures tension and compression of tape pulling mechanism, using specialized scales and gages. Observes alinement of transport and rollers under optical comparitor to insure that system is alined to specified tolerance. (2) Replaces parts and adjusts computer system: Replaces parts, such as resistors, capacitors, triggers, and multivibrators, using miniaturized handtools. Selects wires to replace burned wiring in circuits according to color coding system. Solders wires to components, using miniaturized soldering iron and resin based solder. Replaces bearings in tape drive system, using precision handtools and measuring devices. Alines tape transports and rollers, using precision alinement equipment. Calibrates modules, using electronic testing equipment. (3) Turns knobs and screws to tune and balance testing equipment according to manufacturers' specifications.

D.O.T. Conversion: ELECTRONICS MECHANIC, COMPUTER (any ind.) 828.281

ELECTRONIC SYSTEMS RESEARCH TECHNICIAN (COMPUTERS) (Continued)

Starting Hourly Wage Rate For Defense Occupation.....$3.70

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
INSPECTOR, SYSTEMS	(electronics)	722.281	None	Lower	Indeterminate
ELECTRONICS ASSEMBLER, DEVELOPMENTAL	(electronics)	726.281	None	Lower	Indeterminate
TESTER, SYSTEMS	(electronics)	729.381	None	Lower	Indeterminate
			Anything beyond short demonstration up to and including 30 days		
COMPONENT-INSPECTION TECHNICIAN	(electronics)	828.281	Become familiar with computer components and subassemblies.		
CUSTOMER-ENGINEERING SPECIALIST	(office mach.)	828.281	Become familiar with computers and auxiliary equipment.		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 30 days up to and including 3 months		
ELECTRONICS TECHNICIAN, AUTOMATED PROCESS	(electronics)	726.281	Learn to punch tape following coded production order.	INA	INA
ELECTRIC-ORGAN TECHNICIAN	(any ind.)	828.281	Become familiar with electric organ circuit diagrams, service manuals, and specialized test equipment.		
RADIOACTIVITY-INSTRUMENT-MAINTENANCE-TECHNICIAN	(petrol. production)	828.281	Become familiar with electrical radioactivity detecting instruments.		
			Over 3 months up to and including 6 months		
ELECTRONIC-SALES-AND-SERVICE TECHNICIAN	(profess. & kin.)	828.251	Develop sales techniques and learn to evaluate customer requirements. One responding employer indicates a formal company training course of unspecified duration.	Lower	INA

Defense Job Title: ELECTRONIC SYSTEMS RESEARCH TECHNICIAN (INSTRUMENTATION DEVELOPMENT)

Develops, fabricates, and tests digital computers and high-speed, high frequency counters used to measure parameters during the testing of rocket propulsion systems, applying knowledge of electronic theory: (1) Plans and fabricates experimental circuitry: Confers with engineering personnel to determine functional criteria of instrumentation, such as digital computers and high frequency counters, used in the testing of rocket power plants. Plans circuitry and selects components, applying knowledge of electronic theory. Assembles and wires components, such as resistors, transistors, and capacitors on breadboard (experimental circuitry), using jeweler's handtools and clips. Tests electronic properties of circuit, using testing equipment, such as meters, bridges, signal generators, and oscilloscopes. (2) Fabricates computers and counters: Bolts components, such as tube sockets and circuit boards to pre-formed cabinet, using hand-tools. Bends wires on components and positions them in holes on printed circuit board, applying knowledge of factors, such as stress points and shielding methods. Selects wires for circuitry according to color coding systems. Joins wires to components, using miniature soldering equipment and multicore or silver core solder, according to knowledge of grounding and shielding. When welding assemblies, positions components to be bonded on stage of spot welding apparatus under binocular microscope and secures them in fixture, using handtools. Observes workpiece through microscope and positions electrodes on seam to be joined. Turns dials to adjust amperage and pressure according to knowledge of properties of materials being bonded. Pulls trigger to close electrodes and form weld. Ties circuit wires together with string or tape to form cables. (3) Tests modules and assembled equipment: Selects methods and equipment and sequence for testing instrumentation according to knowledge of standards of accuracy. Connects testing equipment such as signal generators, counters and dual oscilloscopes to modules and starts equipment to measure parameters associated with frequencies, channels, and formation of wave bands. Connects meters, such as ohmmeters, ammeters, and milliammeters to components to measure efficiency of millivolt and microvolt circuitry. Analyzes data on dials or recorded on graphs to determine whether instrument is functioning as designed, according to knowledge of electronic theory and testing conditions. Modifies circuitry and replaces components according to results of test. (4) Occasionally fabricates brackets, using equipment such as power shears and brake, drill press, and metal lathe.

D.O.T. Conversion: ELECTRONIC TECHNICIAN (profess. & kin.) 003.181

ELECTRONIC SYSTEMS RESEARCH TECHNICIAN
(INSTRUMENTATION DEVELOPMENT) (Continued)

Starting Hourly Wage Rate For Defense Occupation.....$3.70

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
INSPECTOR, SYSTEMS	(electronics)	722.281	None	Lower	Indeterminate
ELECTRONICS ASSEMBLER, DEVELOPMENTAL	(electronics)	726.281	Become familiar with electronics systems.	Lower	Indeterminate
ELECTRONICS MECHANIC	(any ind.)	828.281	Become familiar with electronics systems.	Lower	Indeterminate
Electronics Mechanic, Computer	(any ind.)	828.281	Become familiar with computer components.		
Radar Mechanic	(any ind.)	828.281	Become familiar with radar components.		
			Anything beyond short demonstration up to and including 30 days		
COMPONENT-INSPECTION TECHNICIAN	(electronics)	828.281	Become familiar with computer components and subassemblies.		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Anything beyond short demonstration up to and including 30 days		
CUSTOMER-ENGINEERING SPECIALIST	(office mach.)	828.281	Become familiar with computers and auxiliary equipment.		
			Over 30 days up to and including 3 months		
SYSTEMS-TESTING-LABORATORY TECHNICIAN	(profess. & kin.)	003.181	Become familiar with systems-testing laboratory equipment.		
ELECTRICIAN, RESEARCH	(aircraft mfg.)	726.281	Become familiar with electrical systems research equipment.	INA	INA
ELECTRIC-ORGAN TECHNICIAN	(any ind.)	828.281	Become familiar with electric organ circuit diagrams, service manuals, and specialized test equipment.		
RADIOACTIVITY-INSTRUMENT-MAINTENANCE-TECHNICIAN	(petrol. production)	828.281	Become familiar with electrical radioactivity-detecting instruments.		

Defense Job Title: ELECTRONIC TECHNICIAN "A"

Repairs electronic equipment, such as helium leak detectors, spectrophotometers, closed circuit television systems, and recording devices used in the construction and testing of missiles: (1) Diagnoses problems: Operates equipment in blockhouse or shop to determine areas of malfunction. Tests equipment with electronic testing instruments, such as test bridges and voltmeter to confirm diagnosis or as part of scheduled preventive maintenance. (2) Repairs equipment: Disassembles equipment using such jeweler's handtools as modified pliers and wrenches. Tests vacuum tubes and circuitry, using testing equipment such as milliammeters and potentiometers. Replaces faulty parts such as tubes, transistors, resistors, and capacitors. Calibrates equipment, using electronic testing instruments or compares readings with working standard (precalibrated equipment of same type). Turns set-screws and tightens or loosens parts to adjust instrument response to electrical impulses. Replaces defective wiring or rewires equipment following standard color coding system, blueprint specifications, and manual instructions, and using handtools. (3) Drives pickup truck to transport equipment between shop and blockhouse.

D.O.T. Conversion: ELECTRONICS MECHANIC (any ind.) 828.281

Starting Hourly Wage Rate For Defense Occupation.....$3.56

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
TAPE-RECORDER REPAIRMAN	(any ind.)	720.281	One responding employer indicated employee would need thorough knowledge of transistor amplifier circuitry involving vocation training of 1 year.	Lower	Fair

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
TESTER, SYSTEMS	(electronics)	729.381	None	INA	INA
			Anything beyond short demonstration up to and including 30 days		
TELEVISION SERVICE-AND-REPAIRMAN	(any ind.)	720.281	Learn color and black and white commercial television circuitry. Some responding employers required formal company training ranging from 1 week to 6 months. Some suggested home study courses of unspecified duration.	Lower	Good
COMPONENT-INSPECTION TECHNICIAN	(any ind.)	828.281	Become familiar with electronic computer components and subassemblies.		
CUSTOMER-ENGINEERING SPECIALIST	(office mach.)	828.281	Become familiar with computers and auxiliary equipment.		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 30 days up to and including 3 months		
RADIO REPAIRMAN	(any ind.)	720.281	Learn electronic systems for various products. One responding employer indicates a need for vocational or company sponsored training course of 6 months which would include transistor circuitry.	Lower	Fair
ELECTRIC-ORGAN TECHNICIAN	(any ind.)	828.281	Become familiar with electric organ circuit diagrams, service manuals, and test equipment.		
RADIOACTIVITY-INSTRUMENT-MAINTENANCE-TECHNICIAN	(petrol. production)	828.281	Become familiar with electrical radioactivity detecting instruments.		
			Over 3 months up to and including 6 months		
RADIO MECHANIC II	(any ind.)	823.281	Obtain knowledge of transmitting and receiving equipment and regulations to receive license.	No Significant Difference	Good

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 3 months up to and including 6 months		
RADIO MECHANIC II (Continued)	(any ind.)	823.281	Most responding employers indicate need for licensing. Some suggest vocational training of up to 12 months duration.		

Defense Job Title: ENGINEERING TECHNICIAN

Applies knowledge of mathematics to resolve problems related to analysis and evaluation of missile flight data: (1) Plans approach to problem and selects data: Reads written

ENGINEERING TECHNICIAN (Continued)

pretest documents and instructions, or confers with professional personnel to determine type of problem to be resolved and form in which data is to be presented. Selects raw data, such as computer tab runs, oscillograms, and still and motion pictures, based on knowledge of type of problem to be resolved and familiarity with project data sources. Selects standardized formulas from prepared list of equations to resolve problems, such as strength to weight and power to speed ratios, and aerodynamic effects of design contours, applying knowledge of algebra, trigonometry, and calculus. Applies knowledge of mathematics and physical laws to derive or combine standard formulas. (2) Reduces raw data to usable form: Substitutes raw data from computer tab runs, punched cards, and mathematical tables in standard equation to reduce data. Measures high and low points of traces representing variables, such as voltage, temperature, and trajectory on oscillographs, and data recorded on analog equipment, using standard or special measuring devices and substitutes values in equations as required. Analyzes 16-millimeter pictures of experimental hardware undergoing simulated altitude and pressure tests, using film readout equipment and applies knowledge of X-Y coordinate system and effects of camera angle and speed to reduce data to mathematical form. (3) Prepares data for data processing equipment or performs computations manually. Selects symbols from coding system to convert engineering data into form suitable for electronic data processing. Records symbols on worksheet in specified sequence, following standardized computer program instructions. Gathers punched cards corresponding with worksheet instructions from card punching unit or computer deck storage area and arranges cards in sequence. Routes computer deck to data processing personnel for processing. Constructs charts and graphs from printout data, or reduces data to usable form, as required. Performs manual computation, using calculating machine, planimeter, and slide rule. (4) Evaluates quality and reliability of engineering data: Reads data and applies knowledge of data sampling procedures, mathematical theory, testing procedures, and data processing techniques to evaluate validity of data. Selects scale and data points for plotting data, such as mass distribution, and time history charts on graphs and charts. Interpolates or extrapolates curves based on mathematical knowledge and established company procedures. Examines plotted or tabular data for errors and inconsistencies, based on experience with similar problems and knowledge of mathematics. Examines mathematical values in formulas to detect incorrect substitutions. Reviews coded symbols on worksheet and cards in computer deck for consistency with programmed instructions. Recalculates data as required to detect errors in arithmetic. (5) Analyzes data for conformance with prescribed objec-

ENGINEERING TECHNICIAN (Continued)

tives and prepares reports: Analyzes data relative to test specifications to determine whether missile, systems, subsystems or components performed as anticipated, following specified procedures. Applies knowledge of mathematics, engineering, or science to determine discrepancies in performance. Confers with professional personnel and prepares preliminary technical reports, such as "flash", or "quick-look" reports describing results of test and ultimate effects on missile performance. Prepares various forms of documentation, such as written reports, word charts, tabular form, graphical plots, sketches, pictures, and wiring schematics. Submits reports and documentation to superior for further analysis.

D.O.T. Conversion: MATHEMATICAL TECHNICIAN (profess. & kin.) 020.188

Starting Hourly Wage Rate For Defense Occupation.....$2.98

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
WEIGHT ANALYST, AIRCRAFT	(aircraft mfg.)	020.188	None		

Defense Job Title: FINAL ASSEMBLER

Reworks and modifies missile structures and assemblies and assembles and installs them, during and after mating of all major missile components, applying knowledge of final assembly techniques and engineering design changes, and using handtools and sheet metal equipment: (1) Plans work: Reviews engineering design changes in missile structures and assemblies to ascertain type of rework required. Locates part requiring rework, using blueprints, photographs, charts, and diagrams. (2) Lays out work: Removes part from missile structure, using handtools. Lays out lines of reference and mating points on parts and missile structure according to engineering design changes, using layout tools. (3) Reworks or modifies missile parts and components: Reworks or modifies missile parts, such as clamps, brackets, angles, longerons, supports, bulkheads, and battery boxes, using machines, such as dimplers, routers, nibblers and drill press. Reworks or modifies missile components, such as motors, gyros, and angle-of-attack assemblies, using handtools, such as screwdriver, pliers, and wrench. Assembles missile parts and components, using handtools. (4) Installs parts: Installs reworked, or modified missile parts, such as plumbing lines, electronic cables, harnesses, electronic packages and hydraulic fittings in missile structure, using riveting equipment and handtools. Connects hydraulic and pneumatic hoses and wiring to components, using handtools. (5) Inspects parts: Measures part to assure conformance to blueprint specifications, using precision measuring devices, such as micrometers, calipers, and gages. Confers with company liaison personnel to suggest changes in assembly and installation procedures.

D.O.T. Conversion: None 806.381

FINAL ASSEMBLER (Continued)

Starting Hourly Wage Rate For Defense Occupation.....$2.98

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Anything beyond short demonstration up to and including 30 days		
ASSEMBLER, WELDED DUCTS	(aircraft mfg.)	801.381	Learn torch straightening procedures.		
ASSEMBLER, AIRCRAFT STRUCTURES AND SURFACES	(aircraft mfg.)	806.381	Become familiar with aircraft assembly procedures.		
			Over 30 days up to and including 3 months		
AIRCRAFT MECHANIC, ARMAMENT	(aircraft mfg.)	801.381	Become familiar with functional tests of armaments.		
AIRCRAFT MECHANIC, HEAT AND VENT	(aircraft mfg.	801.381	Learn functional testing procedures.		
AIRCRAFT MECHANIC, RIGGING AND CONTROLS	(aircraft mfg.)	801.381	Become familiar with rigging and control components.		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 30 days up to and including 3 months		
ASSEMBLER, ELECTRO-MECHANICAL	(aircraft mfg.)	806.381	Learn test equipment set-up and operation.		
ASSEMBLY MECHANIC, EXPERIMENTAL AIRCRAFT	(aircraft mfg.)	806.381	Learn test equipment set-ups.		
FABRICATOR-ASSEMBLER, METAL PRODUCTS	(any ind.)	809.381	Learn use of brazing and welding equipment.		
Awning-Frame Maker	(fabric. prod., n.e.c.)	809.381	"	"	
Metal-Screen, Storm Door, and Window Builder	(struct. & ornam. metalwork)	809.381	"	"	
Tubular-Products Fabricator	(any ind.)	809.381	"	"	
LAY-OUT MAN I	(any ind.)	809.381	Learn trigonometry, product design, and effects of heat.		
SHEET-METAL LAY-OUT MAN	(any ind.)	809.381	Learn trigonometry and template making.		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 30 days up to and including 3 months		
STRUCTURAL-STEEL LAY-OUT MAN	(any ind.)	809.381	Learn trigonometry, product design and effects of heat.		

Defense Job Title: HIGH ENERGY FORMING MECHANIC

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Sets up and operates forming press powered by high energy source, such as dynamite, TNT, and ammonium nitrate, to form sheet metal missile developmental parts, such as shells or skins, applying knowledge of high energy forming techniques: (1) Sets up press: Reviews sketches, preliminary design information, written and oral instructions, and incomplete drawings to determine sequence of operations. Positions and alines forming dies on bed and ram of forming press, using gages, shims, rule, or template. Bolts dies to ram and bed of press, using wrench. Adjusts stops to set depth of stroke. Positions sheet metal workpiece between dies. (2) Sets explosive charge: Reviews handbooks, sketches, and charts to determine the amount and type of explosive charge to use, applying knowledge of forming characteristics of sheet metal used, and the characteristics and handling requirements of explosive materials. Positions, alines, and sets charge on ram in proper relationship to die and part to obtain specified results. Connects electric squib, booster charge, wiring, and switches to charge, using handtools, such as screwdriver, wire cutters, and pliers. Reviews firing set-up to assure conformance to instructions, safety precautions, and test requirements. (3) Detonates explosive charge: Signals other workers to remove personnel and equipment from area. Connects wires to

HIGH ENERGY FORMING MECHANIC (Continued)

detonator. Pushes plunger or turns dial to discharge blast that activates forming press to form part. Records sequence of operations, amount and type of charge, and methods used to provide guide for subsequent forming operations. (4) Inspects work: Removes formed sheet metal from press by hand or using hoist. Measures workpiece to assure conformance to specifications, using precision measuring instruments, such as micrometers, calipers, gages, or templates. Contracts company liaison personnel to replace or rework tooling. Recommends change in forming methods.

D.O.T. Conversion: None 617.280

Starting Hourly Wage Rate For Defense Occupation.....$3.49

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Anything beyond short demonstration up to and including 30 days		
BULLDOZER OPERATOR II	(any ind.)	617.280	Learn power press operations.		
DISHING-MACHINE OPERATOR	(any ind.)	617.280	Become familiar with machine operations.		
PRESS OPERATOR, HEAVY DUTY	(any ind.)	617.280	Learn production operations and procedures.		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 30 days up to and including 3 months		
MULTI-OPERATION-FORMING-MACHINE OPERATOR I	(any ind.)	616.380	Become familiar with machine operations.		
Tubing-Mill Operator	(any ind.)	616.380	" "		
PUNCH PRESS SET-UP MAN	(any ind.)	619.380	Learn press set-up procedures.		
BLASTER	(any ind.)	859.281	Learn industrial demolition methods and techniques.		
Stumper	(logging)	859.281	" "		
High Scaler	(const.)	859.281	" "		
SHOOTER, WATER WELL	(const.)	859.281	Learn water well blasting techniques.		
BLASTER	(mining & quarrying)	931.281	Learn mining application of high energy discharge.		
SHOOTER	(petrol. production)	931.381	Learn petroleum production application of high energy discharge.		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 30 days up to and including 3 months		
SHOOTER, SEISMOGRAPH	(petrol. production)	931.381	Learn seismic application of high energy discharges.		
			Over 3 months up to and including 6 months		
MULTI-OPERATION-FORMING-MACHINE SET-UP MAN	(any ind.)	619.380	Learn machine set-up operations.		
Production Mechanic, Tin Cans	(tinware)	619.380	" "		
Rim-Roller Set-Up Man	(auto. mfg.)	619.380	" "		
Tubing-Mill Set-Up Man	(any ind.)	619.380	" "		

Defense Job Title: HYDRAULIC AND FLUID ASSEMBLER

Fabricates, assembles, and installs missile hydraulic and fluid systems parts, according to blueprint specifications, and using fabricating machines and mechanics' handtools:

HYDRAULIC AND FLUID ASSEMBLER (Continued)

(1) Lays out work: Reviews blueprints, plumbing charts, and shop order to ascertain sequence of operations. Measures and marks lines of reference and coordinating points on metal tube stock, missile parts, and components, applying knowledge of arithmetic, and using layout tools, such as scriber, compass, and protractor. (2) Fabricates parts: Turns handle to set stops and guides. Inserts workpiece in dies of machine. Operates tube bending machine, flaring machine, and cutoff saw to bend, flare, and cut tubing for missile fluid systems, according to blueprints, bend data, sketches, or other authorized documents. Removes burrs from fabricated workpiece, using files. Measures workpiece to assure conformance to blueprint specifications, using precision measuring instruments, such as micrometers, calipers, and gages. Fabricates supporting parts, such as fairleads and brackets, using sheet metal handtools and machines. (3) Installs parts: Installs and alines parts,such as tubing, brackets, and fairleads in missile, using handtools, such as screwdrivers, wrenches, and pliers. Operates hydraulic test equipment and vacuum pump to pressure test fluid lines and hoses. Improvises shop aids, such as holding or installing devices to facilitate assembly and installation of parts. Reworks fabricated parts to incorporate design changes.

D.O.T. Conversion: None 862.781

Starting Hourly Wage Rate For Defense Occupation.....$2.98

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
CUT-OFF-SAW OPERATOR, METAL	(mach. shop)	607.782	None		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
BENDING-MACHINE OPERATOR I	(any ind.)	617.782	None		
			Over 3 months up to and including 6 months		
AIRCRAFT MECHANIC, PLUMBING AND HYDRAULICS	(aircraft mfg.)	862.381	Learn use of sheet metal fabricating machines.		

Defense Job Title: HYDRAULIC AND FLUID CHECKOUT MECHANIC

Tests functional operations of missile hydraulic and fluid systems, according to established functional test procedures, and using electrical, electronic, and hydraulic test equipment: (1) Sets up equipment: Reviews blueprints, charts, test specifications, and operations manuals to determine sequence of operations, test equipment used, and test tolerances to apply. Connects pressure simulating equipment to hydraulic and fluid systems to place them under liquid, air, gas, or vacuum pressure, applying knowledge of hydraulic and fluid test procedures. Connects test instruments, such as oscilloscope, electric meters, and graphic recorders to record test data. (2) Synchronizes mechanical

HYDRAULIC AND FLUID CHECKOUT MECHANIC (Continued)

components: Synchronizes mechanical and hydraulic members by timing and adjusting arms, cylinder strokes, and valves, using handtools, such as wrenches, screwdrivers, pliers, and special plumbing, and fluid fabrication, installation, and assembly tools, and applying knowledge of information in shop manuals. (3) Records data: Starts test equipment. Observes instrument dials and indicators and records such data as loss, wave forms, ripple, frequency, voltage, and current applying knowledge of electronic testing shop practices and procedures and electronic theory. (4) Locates and reworks malfunctioning part: Locates malfunctioning part, applying knowledge of check-out procedures. Reworks, replaces, or adjusts parts to correct cause of malfunction, using mechanics' handtools.

D.O.T. Conversion: HYDRAULIC TESTER (aircraft mfg; air trans.) 621.281

Starting Hourly Wage Rate For Defense Occupation.....$3.20

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 30 days up to and including 3 months		
EXPERIMENTAL MECHANIC II	(aircraft mfg.)	621.281	Learn aircraft engine test operations and procedures.		
PNEUMATIC TESTER AND MECHANIC	(aircraft mfg.)	621.381	Learn pneumatic systems functions and operations.		

Defense Job Title: INSPECTOR, ELECTRONIC ASSEMBLY

Inspects electronic components and subassemblies used in missiles for workmanship and conformance to specifications: (1) Inspects cables and harnesses while working with another worker. Reads test procedures instructions to worker engaged in setting up DITMCO equipment and observes adjustments and settings made by worker to insure conformance to instructions. Records data called out by equipment operator and compares data with manual diagrams that indicate the defective wire. Examines wire connections at terminal posts of test equipment to detect loose or wrong connections. Rejects cables and harnesses that do not meet specifications. (2) Visually inspects units, subassemblies, and assemblies: Reads diagrams and blueprints for units, such as dynamotors, transmitters, power supplies, telemeter assemblies, oscillators, antennas, cameras, voltage regulators, filters, converters, modulation couplers, and resistor panels to ascertain relative position of circuitry and components. Examines circuitry to insure that wiring conforms to blueprint or diagram specifications on color coding, routing, and clearances. Examines soldered joints to detect burned spots, creep (solder flow between wires), and wire abrasions that could effect performance of unit, according to knowledge of soldering techniques. Observes fit and clearance of mechanical parts, such as gears, bearings, shafts, splines, fittings, valves, cylinders, and pins and measures dimensions, using gages, to insure conformance to specifications. Prepares report describing extent and location of defects in units. Compares results of inspection with test specifications to ascertain whether unit meets standards. Occasionally uses magnifying glass, microscope, and hardness tester to inspect physical properties of welded modules. (3) Occasionally, personally inspects cables and harnesses: Reads manual of test procedures to ascertain how equipment is to be set up. Bolts designated wired board to DITMCO equipment, using wrenches. Connects wires or cables identified by serial number, to test apparatus with designated clips. Turns knobs to select function, such as voltage breakdown or continuity, to be tested. Pushes button to activate machine that tests electrical properties of cables and harnesses. Observes lights on control panel and compares position of lights that indicate malfunction, with diagrams describing set up to locate faulty wire. Inspects set up to insure that defect is not caused by crossed wires or incomplete connections. Records results of test on standardized form and accepts or rejects unit according to whether test results satisfy product standards.

D.O.T. Conversion: INSPECTOR, SUBASSEMBLIES (electronics) 726.384

INSPECTOR, ELECTRONIC ASSEMBLY (Continued)

Starting Hourly Wage Rate For Defense Occupation.....$3.29

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
INSPECTOR, FINISHING	(electronics)	726.384	None	Lower	Indeterminate
INSPECTOR, SUBASSEMBLIES	(electronics)	726.384	None		
Check Inspector	(electronics)	726.384	None		
			Anything beyond short demonstration up to and including 30 days		
CALIBRATOR, RESISTORS	(electronics)	726.384	Learn how to compute variation in length of resistor wire in order to attain specified resistance.	Lower	INA
INSPECTOR, PRINTED CIRCUIT BOARDS	(electronics)	726.384	Learn use of precision measuring instruments and how to detect sealing defects in plastic covered board.	Lower	Indeterminate

Defense Job Title: INSPECTOR, ELECTRONIC ASSEMBLY, SENIOR

Conducts functional tests on electronic assemblies, subassemblies, and components, used in missile control systems, according to knowledge of assemblies, test procedures, and electronic theory: (1) Selects and connects test instruments: Reads blueprints, specifications, and test procedures to determine product to be tested, such as transistorized power supplies, receivers, diplexers, filter cavities, relays and accelerometers. Compares testing instruments mounted in test console with instruments designated in specifications to verify that testing input and recording devices conform with specifications. Verifies accuracy of recording equipment calibration by observing response of instrument to known power input. Turns knobs to tune and aline test instrument in accordance with manufacturers' specifications. Bolts component or assembly to be tested to holding fixture on test apparatus, using wrenches. Connects power input, testing apparatus, and recording equipment, using cables, plugs, and clamps. (2) Tests performance of assemblies, subassemblies, and components: Turns knobs on equipment, such as frequency counters, oscillators, power supplies, vibrators, ovens, rate tables, oscilloscopes, vacuum tube, voltmeters, and distortion analyzers, to regulate variables, such as voltage, frequency, temperature, and humidity following specified test procedures. Turns on equipment to simulate environmental conditions during flight of vehicle and to record performance of assembly, subassembly, or component under simulated conditions of flight. Monitors meters, lights, and recording instruments at test console to insure that power supplies, testing equipment, and recording apparatus function within limits of test specifications and safety regulations. (3) Analyzes results of test: Reads meters, graphs, and oscilloscopes to determine such factors as gain, loss, noise, ripple, frequency, insertion loss, voltage, and current. Computes factors, such as gain, bandwidth, and alpha or beta transfer functions, when data is incomplete from direct readings, using algebraic and trigonometric formulas. Analyzes results to determine characteristics of unit being tested. Records test results on standardized forms. Evaluates performance of unit based on knowledge of test specification and characteristics of item being tested. (4) Troubleshoots defective assemblies and components: Reads logic diagrams, or tests assemblies to detect defective components and subassemblies, according to knowledge of principles of electronics and using test equipment. Examines color coded wires and compares circuitry with diagrams to insure that assembly is wired according to specifications. Occasionally replaces component or subassembly, using handtools. (5) Accepts or rejects items: Inspects soldered joints for holding ability, creep, and neatness. Pulls wires to detect wires too tight or too loose. Examines wires for abrasions.

INSPECTOR, ELECTRONIC ASSEMBLY, SENIOR (Continued)

Stamps items passing visual inspection and functional tests with identifying data and signs acceptance documents. Reviews documentation for completeness. Prepares description of rejected systems, such as tested characteristics, and type and extent of defect. Occasionally witnesses functional tests on systems, conducted by personnel in other classifications, inspects these systems, and stamps acceptable systems.

D.O.T. Conversion: None 722.281

Starting Hourly Wage Rate For Defense Occupation.....$3.29

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 30 days up to and including 3 months		
TESTER, MOTORS AND CONTROLS	(elec. equip.)	721.281	Learn characteristics of assemblies being tested.	Lower	Indeterminate
INSTRUMENT SHOPMAN	(tel. & tel.)	722.281	Learn functional parts of telephone and telegraphic equipment. Two responding employers indicated a formal company sponsored training course would be necessary. One of 15 days duration, the other 3 to 6 months.	Lower	Good
INSTRUMENT INSPECTOR	(aircraft mfg.)	722.381	Become familiar with airplane navagational and control instruments and flight simulation		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 30 days up to and including 3 months		
INSTRUMENT INSPECTOR (Continued)	(aircraft mfg.)	722.381	equipment.		
Electronic Instruments	(aircraft mfg.)	722.381	" "		

Defense Job Title: INSPECTOR, ELECTRONIC FUNCTIONAL TEST

Tests a complete electronic system, such as guidance, flight control, and communications systems used in missiles, prior to installation in vehicles for conformance to blueprints, specifications, and established testing procedures: (1) Selects and connects test instruments: Reads test procedures and product specifications to determine type and sequence of functional and environmental tests to be conducted. Compares testing instruments, such as function generators, signal generators, oscilloscopes, oscillographs, X-Y recorders, and audio-oscillators in test console with specifications to insure that instruments correspond with requirements. Selects alternative test instruments, as required, based on knowledge of instrument capacities and range of conditions to be tested. Connects electronic testing instruments to environmental testing equipment, such as shock testing, vibrator systems, ovens, and humidity chambers with cables, leads, and plugs, according to knowledge of instrumentation hookup. Compares responses of measuring and recording instruments to electrical input to determine accuracy of test instrument

INSPECTOR, ELECTRONIC FUNCTIONAL TEST (Continued)

readings. Bolts system being tested to environmental testing device or to test fixture, using wrenches. Turns knobs to regulate variables, such as voltage, signal, and frequency. (2) Tests systems and evaluates data: Turns on environmental testing equipment to simulate conditions of vehicle in flight, such as shock, vibration, heat, and humidity. Monitors instruments, such as oscillographs, meters, X-Y recorders, and distortion analyzers to determine performance of system under environmental conditions. Prepares graphs and charts and solves mathematical equations to reduce data to usable form. Analyzes wave forms, traces, graphs, and meter readings to determine whether system meets specified performance standards. Accepts or rejects system based on evaluation of test data and knowledge of product specifications. (3) Diagnoses malfunctions: Reviews test results, studies coded logic diagrams, and applies knowledge of characteristics of specific system to determine location of defect. Computes values, such as voltage and amperage, using data on diagram and applying knowledge of electronic theory. Tests assemblies, subassemblies, and components, using standard electronic testing equipment, such as voltmeters, ammeters, oscilloscopes, and signal generators and compares measurements with theoretical values to determine whether units function at maximum efficiency. Conducts further tests on units suspected of malfunctioning, to isolate precise defects. Adjusts variables on subcarrier oscillator, such as bandwidth, sensitivity, phase, and gain, using screwdriver. Replaces assemblies, subassemblies, and components, using handtools. Compares installation of circuitry and subsystems with data on blueprints and diagrams to detect errors in assembly. Pulls wires to test tautness and examines soldered joints for appearance and workmanship. Stamps approved articles and signs documents. (4) Prepares documentation on test results: Fills out standardized form following specified procedure. Prepares report describing nature and extent of defect and effect of defects on performance. Recommends changes in testing procedures or product design based on knowledge of missile program objectives.

D.O.T. Conversion: None 722.281

INSPECTOR, ELECTRONIC FUNCTIONAL TEST (Continued)

Starting Hourly Wage Rate For Defense Occupation.....$3.49

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 30 days up to and including 3 months		
TESTER, MOTORS AND CONTROLS	(elec. equip.)	721.281	Learn characteristics of assemblies being tested.		
INSTRUMENT SHOPMAN	(tel. & tel.)	722.281	Learn functional parts of telephone and telegraphic equipment.		
INSTRUMENT INSPECTOR	(aircraft mfg.)	722.381	Become familiar with aircraft navagational and control instruments and flight simulation equipment.		
Inspector Electronic Instruments	(aircraft mfg.)	722.381	"	"	

Defense Job Title: INSPECTOR, ELECTRONIC SYSTEMS

Tests prototype electronic devices used in rocket control systems and evaluates data applying knowledge of electronic theory: (1) Tests prototype equipment: Discusses properties and specifications of devices to be tested with engineering and technical personnel and studies blueprints and sketches to determine variables, such as standards of accuracy and environmental conditions. Selects testing equipment, such as meters, test bridges, power sources, oscilloscopes, and electronic counters, according to such factors as equipment design, type and range of characteristics to be measured, and performance standards of accuracy. Connects testing equipment to device to be tested, such as computors, actuator systems, timing devices, amplification systems, and relay switching devices, using leads with plug-in attachments. Adjusts controls on testing equipment to vary conditions, such as power input and frequency, to measure effectiveness of systems under range of conditions, according to knowledge of testing equipment and procedures. Analyzes data on instruments, such as cathode ray oscilloscope, electronic counters, X-Y recorders, and test meters to determine adequacy of equipment performance, according to knowledge of electronic theory. Applies standard mathematical formulas to data to determine characteristics of system unavailable by direct readings. Compares test results and computations with product specifications to determine whether product meets standards. (2) Locates malfunctions or defects in product design. Isolates location of malfunction based on configuration of data and knowledge of electronic systems. Inspects wiring to insure that wire in circuit conforms with specifications, or to detect loose wires or faulty joints. Tests components, such as resistors, transistors, and capacitors to locate shorts and current leakage, using ohmmeter, ammeter, milliammeter, and oscilloscope. Identifies faulty parts with tags. Writes report describing malfunctions and recommends changes, such as type of wire, substitution of components, and arrangement of parts based on knowledge of characteristics of metals used in components, environmental factors peculiar to rockets, and electronic design.

D.O.T. Conversion: None 729.281

INSPECTOR, ELECTRONIC SYSTEMS (Continued)

Starting Hourly Wage Rate For Defense Occupation.....$3.70

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
ELECTRICAL-EQUIPMENT TESTER	(aircraft mfg.)	729.381	None	Lower	Indeterminate
			Over 30 days up to and including 3 months		
FINAL TESTER	(elec. equip.)	721.381	Learn use of slide rule and precision measuring instruments.		
TESTER, SYSTEMS	(electronics)	729.381	Learn methods and procedures for functional environmental testing.	Lower	Indeterminate
Calibration Tester	(electronics)	729.381	" "		
Continuity Tester	(electronics)	729.381	" "		
Electrical Tester	(electronics)	729.381	" "		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 30 days up to and including 3 months		
Memory-Unit Test Technician	(electronics)	729.381	Learn methods and procedures for functional environmental testing.		
Television-Receiver Analyzer	(electronics)	729.381	" "		
Trouble Shooter	(electronics)	729.381	" "		
			Over 3 months up to and including 6 months		
X-RAY-EQUIPMENT TESTER	(any ind.)	729.281	Learn to operate x-ray control meter. One employer indicated vocational training of unspecified duration would be necessary.	Lower	Good
RELAY TESTER	(light,heat & power)	729.281	Learn adjustment required in calibration and repair of equipment. One responding employer indicates their union-management contract calls for filling vacancies with qualified employees from within the company before	Higher	INA

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 3 months up to and including 6 months		
RELAY TESTER (Continued)	(light,heat & power)	729.281	recruiting from other sources.		

Defense Job Title: INSPECTOR-ELECTRONIC TEST, SYSTEMS

Tests electronic systems, such as guidance, flight control, telemetry, and power plant, installed in missile to determine vehicle acceptability, using specially developed tape-controlled testing device: (1) Prepares test equipment: Reads test specifications to ascertain type of test instrument to be used, such as missile flight simulators and servo signal simulators. Compares standard and special electronic input and readout instruments in control console with instruments listed in test specifications to insure conformance to specifications. Replaces or substitutes input and readout instruments, such as function and signal generators, oscilloscopes, and frequency plotters, according to knowledge of instrument capacities and range of parameters to be tested, and using handtools. Connects leads and cables between test instruments and electronic systems of missile, according to knowledge of test procedures and circuitry. Calibrates test instrument, to insure that instrumentation will measure parameters according to standards of accuracy. Positions specified pre-punched tape in console and turns on equipment that automatically controls sequence of test, or turns knobs, to regulate variables, such as voltage, frequency range, DC voltage level, and signal inputs. (2) Monitors console during test: Observes meters, dials, and lights of measuring and recording instruments

INSPECTOR-ELECTRONIC TEST, SYSTEMS (Continued)

during test to insure that vehicle systems function within specified limits. Reads data on test instruments, such as digital and analog voltmeters, oscillographs, frequency plotters, audio oscillators, and distortion analyzers, and records data in log. Pushes alarm button to warn workers of danger from high voltage fire or explosion, according to knowledge of system limitations and safety regulations. (3) Analyzes test results: Plots data on graphs and charts, as required, and reduces data, using standard math formulas. Analyzes charts, traces, and wave form patterns to determine whether vehicle systems conform with specifications applying knowledge of electronic theory, system characteristics, and systems interactions. Isolates malfunctioning systems or units by testing them, analyzing data, and applying knowledge of typical performance of each system. Prepares reports describing test procedure, performance of test, and pertinent changes in test procedure to measure additional parameters, applying knowledge of technical reporting and product specifications. Accepts or rejects vehicle based on performance results. Occasionally removes assemblies and subassemblies from vehicle and installs replacement units, using handtools. (4) Inspects electronic and fluid systems, and structures, for conformance to specifications: Reads blueprints and inspects installation of fluid systems, such as actuators and thrust vector control systems for conformance to specifications. Examines structural components for workmanship, such as position of drilled holes, fit of parts, and smoothness of finish. Inspects electronic systems, such as guidance, control, and telemetry, to insure that circuitry, components, assemblies, and subsystems are installed as specified. Examines wires and soldered joints for defects such as burns, creep, or wire abrasions that could eventually affect performance of unit. Inspects wiring and soldering for neatness. Occasionally uses measuring devices, such as calipers and gages to measure physical dimensions and uses microscope to examine soldered joints. (5) Prepares documentation: Stamps identifying mark on designated surface of systems to indicate conformance to performance and appearance requirements, and signs inspection documents. When system does not meet specifications, prepares technical description of location and extent of malfunction. Recommends changes in design or test procedures to improve product performance.

D.O.T. Conversion: None 722.281

INSPECTOR-ELECTRONIC TEST, SYSTEMS (Continued)

Starting Hourly Wage Rate For Defense Occupation.....$3.64

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 30 days up to and including 3 months		
TESTER, MOTORS AND CONTROLS	(elec. equip.)	721.281	Learn characteristics of assemblies being tested.		

Defense Job Title: INSPECTOR, FABRICATION AND STRUCTURES

Inspects structural sheet metal parts and assemblies used in missiles for conformance with specifications, following specified techniques: (1) Inspects dimensions and assembly of structural components, using a variety of inspection procedures: Reads blueprints, specifications, and work orders to ascertain dimensions and tolerances of parts. Measures dimensions of parts, using measuring instruments, such as straightedge, calipers, and micrometers. Performs surface plate measurements to verify dimensions and alinement of parts, using jo blocks, surface plate, and height gages. Measures angles, using sine bar. Measures configuration of two dimensional parts, using templates. Inspects rivets, bolts, fasteners, and screws for conformance with specifications on position, size, and type. Applies torque wrench to bolts to insure that they are tightened as specified. Visually inspects welds for size of bead to insure that seam will not interfere with mating or movement of other parts. Inspects metal and plastic tubing for specified location, and degree and relations of bends, using inside micrometer of specially designed measuring devices. Examines highly stressed parts for cracks or bends. Tests tensile strength of part by suspending it from device similar to weight scale and pulling on part until dial indicator reaches number designated in specifications. (2) Inspects assembled parts for conformance with specifications: Observes position of parts, such as clamps, brackets, and bulkheads to insure that parts mate and assembly coincides with specifications. Inspects the installation of functional items, such as electrical, electronic, hydraulic, and fluid assemblies for conformance to specifications on location, clearance, color coding, finish, and alinement, following prescribed checkout procedures. (3) Accepts or rejects units: Reviews data compiled from inspection procedures and compares it with specifications to ascertain whether units meet standards. Stamps acceptable units and prepares documentation describing measurements and type and extent of defects.

D.O.T. Conversion: None 807.381

INSPECTOR, FABRICATION AND STRUCTURES (Continued)

Starting Hourly Wage Rate For Defense Occupation.....$3.10

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Anything beyond short demonstration up to and including 30 days		
INSPECTOR, FABRICATION	(aircraft mfg.)	807.381	Learn techniques for inspecting wood and plastic parts.		
Inspector, Hammers and Presses	(aircraft mfg.)	807.381	" "		
Trim and Cover Inspector	(aircraft mfg.)	807.381	" "		

Defense Job Title: INSPECTOR, FINAL

Performs complete final inspection of structural assemblies and mechanical systems before and after installation in missiles: (1) Inspects systems and structural units for workmanship, alinement, and accuracy of installation: Reads blueprints and specifications to determine dimensions, tolerances, and position of various structural, mechanical, electrical, and electronic systems. Computes unknown dimensions and angles, using

INSPECTOR, FINAL (Continued)

trigonometry. Inspects alinement of structural assemblies, using height gages, levels, transits, and optical measuring devices. Conducts section by section shakedown of a completed missile for completeness and accuracy of installations, specified alinement of parts, and freedom of movement, clearances, tension, and throw limits of functional systems, applying knowledge of systems, structural assemblies, and inspection procedures and techniques, and using special and standard measuring devices. Verifies position of assemblies with respect to design changes and customer requirements. Compares serial numbers on parts with those on data sheet to insure conformance to specifications and records number on log. (2) Performs operational checkout on electrical, electronic, and hydraulic systems before and after installation in missile: Opens valves to allow hydraulic fluid to enter hydraulic systems. Reads dials on instrumentation indicating variables, such as pressure and flow, and observes movement of mechanical assemblies, valves and actuating arms to insure that systems function according to specifications. Starts electrical and electronic systems and tests systems for continuity, using measuring instruments, such as voltmeters and meggers. (3) Accepts or rejects components, units, systems, or missiles: Evaluates data gathered during inspection procedures to determine whether products meet customer specifications, applying knowledge of installation and production methods and engineering and customer requirements. Prepares documentation describing defects or variations that could affect performance.

D.O.T. Conversion: None 806.281

INSPECTOR, FINAL (Continued)

Starting Hourly Wage Rate For Defense Occupation.....$3.29

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
INSPECTOR, ASSEMBLIES AND INSTALLATIONS	(aircraft mfg.)	806.381	None		
Engine Installation Inspector	(aircraft mfg.)	806.381	None		
Inspector, Final Assembly	(aircraft mfg.)	806.381	None		
Inspector, Subassembly	(aircraft mfg.)	806.381	None		
OUTSIDE-PRODUCTION INSPECTOR	(aircraft mfg.)	806.381	None		

Defense Job Title: INSPECTOR, HYDRAULIC-PNEUMATIC FUNCTIONAL TEST

Tests various electro-pneumatic-hydraulic systems used in missiles, applying knowledge of hydraulic and pneumatic systems, and using standard or tape-controlled electronic and hydraulic testing equipment: (1) Prepares equipment for test: Reads work orders and specifications to determine sequence of tests and product performance standards. Modifies standard and special hydraulic testing equipment by installing pipes, hoses, and valves according to configuration of product being tested, specified testing conditions, and safety regulations. Bolts, clamps, or screws systems or components, such as actuators, thrust vector control system, and pressure switches to be tested, to test appartus, using handtools. Verifies type of input and recording equipment in test console with equipment listed in test specifications. Tests responses of recording equipment such as oscilloscopes, X-Y plotters, and voltmeters with known input to insure that equipment is calibrated to meet standards. Connects cables between power sources, test apparatus, and recording instruments. (2) Tests electro-hydraulic-pneumatic systems: Preheats specified testing fluid according to specifications. Dumps fluid into hopper of testing apparatus. Turns knobs on console to regulate variables, such as voltage, pressure, and rate of flow, following specified procedures or places pre-punched tape in console that automatically regulates variables in prescribed sequence. Turns on equipment, such as ratio transformers, oscillographs, frequency counters, ammeters, power supplies, pumps, vibrators, and amplifiers to simulate conditions of flight of missile and to record performance of product being tested. Monitors instrumentation by reading dials and observing lights on console during test to insure that equipment functions within specified standards. Measures factors, such as leakage rates and pressure drops, using pressure gages and flow meters and plots response to stimuli. (3) Analyzes data recorded during test: Analyzes computer print-out, graphs, and charts showing responses, such as linearity, scale factor, resolution, total stroke, and non-electrical hysteresis, to determine performance of system under varied stimuli. Determines conformance of product performance to specifications, utilizing test results and applying job knowledge. Accepts or rejects product according to established standards. Prepares documentation describing nature of malfunction, such as leaks and overheating, for defective systems. Recommends changes in test procedure to measure additional parameters, based on knowledge of systems and test equipment. (4) Cleans hoses, components, and test apparatus by flushing or soaking in solvent.

D.O.T. Conversion: HYDRAULIC TESTER (aircraft mfg.; air trans.) 621.281

INSPECTOR, HYDRAULIC-PNEUMATIC FUNCTIONAL TEST (Continued)

Starting Hourly Wage Rate For Defense Occupation.....$3.42

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
TESTER, PLUMBING SYSTEMS	(aircraft mfg.)	806.381	None		
			Anything beyond short demonstration up to and including 30 days		
INSPECTOR, AIRCRAFT ACCESSORIES	(aircraft mfg.)	709.281	Learn use of precision measuring instruments and testing equipment.		

Defense Job Title: INSPECTOR, MACHINED PARTS, PRECISION*

Inspects regularly or irregularly contoured forgings, castings, or raw stock, or machined parts used in missiles, applying knowledge of machine shop measuring devices and inspection techniques: (1) Determines method of inspecting parts: Reads blueprints to

INSPECTOR, MACHINED PARTS, PRECISION (Continued)

determine variables, such as dimensions, tolerances, and type of material used in parts. Computes dimensions and angles not supplied in specifications, applying knowledge of trigonometry. Selects methods and procedures for inspecting angles and dimensions of parts based on factors, such as size and configuration of part and dimensional tolerances. (2) Inspects parts: Positions parts, such as forged rings, magnesium castings, and shaker fixtures on surface plate and measures dimensions of parts applying knowledge of inspection procedures and using jo blocks, parallel bars, and height gages. Measures angles, using standard or optical rotabs. Verifies coordinates and points of reference, using a Ferranti measuring instrument. Inspects threads, gears, splines, or serrated parts by measuring each individual surface, using one or a combination of standard and electronic gages, or examines configuration of part, using optical comparitor. Determines whether product meets specifications according to knowledge of inspection procedures, product specifications, and machine shop practices. (3) Prepares documentation describing nature and extent of defects. Stamps acceptable items and routes defective items for rework.

D.O.T. Conversion: None 600.281

Starting Hourly Wage Rate For Defense Occupation.....$3.42

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
TURBINE INSPECTOR	(engine & turbine)	609.381	None		
INSPECTOR, FLOOR	(mach. shop)	609.381	None		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
PROPELLER INSPECTOR	(ship & boat bldg. & rep.)	609.381	None		
			Over 30 days up to and including 3 months		
INSPECTOR, METAL FABRICATING	(any ind.)	619.281	Learn to use magnaflux and hardness testing equipment. Become familiar with layout techniques.		

Defense Job Title: INSPECTOR, MISSILE AND SYSTEMS TEST

Inspects structural, electronic, and hydraulic parts and systems of developmental missiles for workmanship and conformance to specifications: (1) Inspects work: Reads blueprints, product specifications, and test procedures to determine specified work procedures, layout, and tolerances. Inspects installation of air frame and systems, such as propulsion, electrical power, guidance, telemetry, and fluid, to insure that installation conforms with specifications. Examines surfaces of skin and structural components for contaminants or defects, such as dirt, fingerprints, nicks, and scratches that can affect functional performance of vehicle. Inspects wiring of systems for conformance

INSPECTOR, MISSILE AND SYSTEMS TEST (Continued)

with blueprints and diagrams. Examines fit of parts to insure conformance with standards specified in contract. (2) Observes testing of vehicles: Observes workers testing electronic and fluid systems to insure that test procedures are followed and systems function as specified. Records measurements called out by workers, such as voltage, temperature, pressure, dimensions, clearances, and alinement. Determines whether vehicle meets standards based on results of tests, visual inspection, and evaluation of vehicle functions. (3) Prepares documentation certifying worthiness of vehicle: Reads serial numbers on components and systems and compares numbers with specifications for verification. Reads inspection reports compiled by workers during fabrication and assembly process to insure that process data has been recorded according to directions and to insure that vehicle structure and systems were manufactured under specified environmental conditions. Prepares report describing location, nature, and extent of malfunctions on rejected missiles. Prepares request for rework on defective systems.

D.O.T. Conversion: INSPECTOR, GUIDED MISSILES ELECTRONIC SYSTEMS (gov. ser.) 722.281

Starting Hourly Wage Rate For Defense Occupation.....$3.64

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
OUTSIDE-PRODUCTION INSPECTOR	(aircraft mfg.)	806.381	Learn use of hardness tester.		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 30 days up to and including 3 months		
INSPECTOR, ASSEMBLIES AND INSTALLATION	(aircraft mfg.)	806.381	Learn to apply job knowledge to aircraft standards.		
Engine-Installation Inspector	(aircraft mfg.)	806.381	" "		
Inspector, Experimental	(aircraft mfg.)	806.381	" "		
Inspector, Final Assembly	(aircraft mfg.)	806.381	" "		
Inspector, Subassembly	(aircraft mfg.)	806.381	" "		
			Over 3 months up to and including 6 months		
AIRPLANE INSPECTOR	(air trans.)	621.281	Learn FAA regulations and obtain Airframe and Power Plant License and Inspection Authorization.		

Defense Job Title: INSPECTOR, NONDESTRUCT TEST, GENERAL

Conducts a variety of nondestructive tests on metal specimens, or cast, forged, or machined parts used in missiles: (1) Conducts nondestructive tests on cast and forged parts to detect internal structural defects, using ultrasonic equipment: Reads blueprints, specifications, or work orders to determine type of search crystal and settings for equipment. Places part, such as forgings, extrusions, castings, or sheet and bar stock in rack and places rack in vat or suspends part in vat, using hoist. Mounts search crystal in search unit, using clamps and screws. Adjusts sensitivity of equipment according to knowledge of equipment capacities and product specifications, and using work aids, such as transducers and calibration test blocks. Turns knobs on control panel to regulate variables, such as amperage and frequency. Starts equipment and guides search unit, mounted on tracks or movable stand, over surface of part to scan it for defects. Observes surface of part through immerscope or reflectoscope, mounted on search unit, and locates defects, applying knowledge of appearance of surface irregularities. Photographs signal patterns on oscillograph screen, using Polaroid Camera. Analyzes pattern and applies knowledge of ultrasonic method to determine extent of defect. Applies knowledge of product specifications to determine whether or not part meets standards. Stamps acceptable parts or rejects defective parts. Prepares accompanying documentation describing size and nature of defect. Occasionally cuts up part for visual analysis of internal defects, using circular saw. (2) Performs nondestructive tests on heat treated material, using magnetic penetrant equipment: Brushes solution containing iron oxide particles on surface of part. Places part on machine table and positions head of machine above part for testing. Turns knob to adjust equipment amperage according to size of part and data on chart. Starts equipment that magnetizes part, causing iron particles to accumulate in areas of defect. Removes part from table and places it under black light to determine where particles are concentrated. Observes configuration of particles to assess type and location of defect. Files or grinds surface of part to remove cracks, using file or portable grinder. Measures variations in dimensions caused by grinding, using a variety of machine shop gages and measuring devices. Accepts or rejects items based on part specifications. Stamps acceptable items. Prepares documentation to identify location and size of defects. (3) Conducts nondestructive tests to locate surface irregularities in large parts, using dye and black light: Brushes dye on surface of part with brush, allowing dye to penetrate surface defects. Moves part, using hoist, through specified series of chemical solutions and rinses designed to heighten effect of dye. Places part under drier to dry surface of part. Brushes dye

INSPECTOR, NONDESTRUCT TEST, GENERAL (Continued)

developer liquid on surface of part. Examines surface of part under black light to detect surface irregularities, such as cracks or craters. Accepts or rejects part, applying knowledge of product specifications and dye penetrant processing techniques. Stamps acceptable parts. Prepares documents describing type and location of surface defect.

D.O.T. Conversion: None 619.281

Starting Hourly Wage Rate For Defense Occupation.....$3.42

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
INSPECTOR, MAGNETIC	(mach. shop)	609.382	None		
			Over 3 months up to and including 6 months		
RADIOGRAPHER	(any ind.)	199.381	Learn use of radiological equipment, survey meters, and radiation meters.		
X-Ray Technician	(any ind.)	199.381	" "		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 3 months up to and including 6 months		
FLUOROSCOPE OPERATOR	(aircraft mfg.; nonfer. metal alloys)	502.382	Become familiar with fluoroscopic procedures and equipment.		

Defense Job Title: INSPECTOR, PRECISION RESEARCH

Inspects structural and mechanical prototype parts and assemblies, used in developmental missiles or mockup assemblies for conformance to specifications: (1) Inspects structural parts: Reads shop orders and blueprints to determine specified angles, dimensions, and tolerances of fabricated prototype units, such as skins and hydraulic assemblies. Measures dimensions of parts, using work aids, such as straightedges, gage blocks, and height gages and compares measurements with specifications for conformance. Measures three-dimensional angles in various planes, using precision instruments, such as sine bars, rotabs, and gage blocks. Examines metal and plastic parts for imperfections in finish. Inspects configuration of exceptionally small parts or parts worked to very close tolerances to detect defects in shape or finish, using optical measuring equipment, such as flats, comparators, and collimators. Examines articles in various stages of assembly for conformance to specifications applying knowledge of machine shop procedures, and using dimensional and angle measuring devices. (2) Inspects assembled hydraulic

INSPECTOR, PRECISION RESEARCH (Continued)

systems: Reads work orders to ascertain test procedures. Secures prototype system to standard or special test fixture, using bolts or clamps. Connects test fixture to source of gas or fluid used in test, using hoses. Attaches test fixture to electronic input and measuring devices using leads, plugs and cables. Starts equipment that pumps gas or fluid into unit being tested. Reads meters measuring pressure and flow and turns knobs to adjust variables in accordance with specified procedures. Observes wave forms on oscilloscope to determine whether unit performs according to specifications. Accepts or rejects assembly based on functional test. (3) Stamps acceptable items and signs accompanying documentation. Prepares description of location, extent, and type of defect found on rejected parts and assemblies.

D.O.T. Conversion: INSPECTOR, FLOOR (mach. shop) 609.381

Starting Hourly Wage Rate For Defense Occupation.....$3.74

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Anything beyond short demonstration up to and including 30 days		
TURBINE INSPECTOR	(engine & turbine)	609.381	Learn to operate turbine and use vibrascope.		
PROPELLER INSPECTOR	(ship & boat bldg. & rep.)	609.381	Learn verification of machine set-ups. Comment: With the background in machining required by employer and labor organizations, verification of machine set-ups should be easy to relearn.		

Defense Job Title: INSPECTOR, PROCESSING

Inspects missile parts that have been painted, cleaned, coated, or etched, for conformance to blueprints, specifications, and engineering data: (1) Inspects painted components: Observes surface of painted parts for drips, runs, and coverage of object. Moves fingers over surface of parts to detect flaws, such as blisters and sags. Reads work orders to ascertain specifications for thickness of paint. Measures thickness of paint, using specially developed gage (similar in principle to hardness tester) or micrometer. Scratches surface of part with fingernail and evaluates degree of paint adhesion, applying job knowledge. Rejects parts not meeting specifications and routes them for rework. Stamps acceptable items or prepares identification tags and documentation. (2) Observes cleaning and coating processes: Visually inspects parts that have been cleaned by such methods as degreasing and sandblasting to insure that all dirt and scale have been removed. Reads specifications to ascertain dimensions on parts to be masked. Measures masked areas to insure conformance to specifications, using ruler. Observes workers loading parts into racks and informs them of correct loading procedures. Observes color of various solutions and measures strength of solution to ascertain whether strength of solution meets standards, using gages. (3) Inspects coated objects: Examines parts coated with protective or decorative finishes for imperfections and blemishes. Files edge of part to ascertain thickness of coating. Measures reflected light from part using specially designed gage, and compares direct readings with specifications to ascertain whether finish meets standards. Stamps acceptable parts and prepares accompanying documentation. Routes rejected parts for rework.

D.O.T. Conversion: None 807.387

INSPECTOR, PROCESSING (Continued)

Starting Hourly Wage Rate For Defense Occupation.....$3.10

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Anything beyond short demonstration up to and including 30 days		
INSPECTOR I	(nonfer. metal alloys)	619.384	Learn to use hardness tester and vernier calipers.		
			Over 30 days up to and including 3 months		
SALVAGE MAN	(nonfer. metal alloys)	619.387	Learn specifications on types and sizes of metal which can be salvaged.		
INSPECTOR, SURFACE PROCESSING	(aircraft mfg.)	807.387	Learn to operate hardness tester and acquire techniques for inspecting painted surfaces and heat treated parts.		
Inspector, Plating and Anodizing	(aircraft mfg.)	807.387	" "		

Defense Job Title: INSPECTOR, RADIOGRAPHIC

Inspects radiographic pictures of components used in rocket power plants to detect such defects as separations, cracks, and inclusions: (1) Plans set up and procedure for X-raying components: Specifies number and angles of shots according to component specifications. Selects factors in equipment set up, such as exposure time and distance, power source, and procedures of film development based on knowledge of X-ray technique in relation to configuration and material being analyzed. (2) Interprets X-rays: Observes film in viewer and identifies type and location of defect, such as de-laminations, separations, cracks, inclusions, and sand pockets, according to configuration of image on film. Positions points of compass on each side images of chamber walls, liners, and insulators, reads scale, and compares reading with data on chart to determine whether thickness of walls meets specifications. Prepares report including data, such as part name, serial number, and variations in component from specifications, to be used by inspection and engineering personnel in subsequent evaluation. (3) Occasionally operates X-ray equipment: Places part on stand between source of rays and film, manually or using hoist. Masks areas with lead shields to be protected from rays. Adjusts controls of machine to take picture. Develops film, using automatic developing equipment, or mixes solutions and develops plates by hand.

D.O.T. Conversion: None 199.381

Starting Hourly Wage Rate For Defense Occupation.....$3.55

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
RADIOGRAPHER	(any ind.)	199.381	None	Lower	Indeterminate

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
X-Ray Technician	(any ind.)	199.381	None		

Defense Job Title: INSPECTOR, ROCKET ENGINE TEST

Inspects solid and liquid rocket propulsion systems in test stand before and after firing for conformance to specifications, using precision measuring instruments: (1) Inspects rocket engine for damage: Visually and tactually inspects metal, carbon, and plastic parts for imperfections, such as dents, nicks, cracks, and paint blisters caused by handling during transportation of engine to test stand. Measures critical dimensions of rocket, such as orifices and threaded holes, using such standard or modified precision measuring devices as gages, calipers, and micrometers. Verifies pressure of torqued bolts on turbo pump, using torque gage. Observes mechanical testing of actuators, valves, and pumps, which have been installed in specially designed testing devices to insure that objects function according to standards. Observes installation of power plant in test stand and periodically measures and inspects parts. (2) Inspects and tests electrical systems: Reads plans describing installation of instrumentation and control systems between control room and test stand. Inspects installation of wiring, conduit, and instrumentation hookup on power plant and in control room to insure that electrical installation conforms with specifications. Measures variables in circuitry, using test meters, such as voltmeters, ammeters, milliammeters, and ohmmeters. Inspects grounding systems and other safety features to insure conformance with plant specifications.

INSPECTOR, ROCKET ENGINE TEST (Continued)

(3) Compares serial numbers on hardware, auxiliary equipment, and instrumentation, with data on worksheet to insure that items installed for testing are as specified. (4) Inspects mechanical and electrical systems after abortive test, using precision measuring devices and test meters to locate cause of mechanical or electrical failure. (5) Records measurements and prepares descriptions of defects and malfunctions following standard procedures.

D.O.T. Conversion: None 806.281

Starting Hourly Wage Rate For Defense Occupation.....$3.55

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
INSPECTOR, ASSEMBLIES AND INSTALLATION	(aircraft mfg.)	806.381	One responding employer indicated a Class "A" license issued by F.A.A. would be required.	Lower	Indeterminate
Engine Installation Inspector	(aircraft mfg.)	806.381	None		
Inspector, Final Assembly	(aircraft mfg.)	806.381	None		
Inspector, Subassembly	(aircraft mfg.)	806.381	None		
Inspector, Experimental	(aircraft mfg.)	806.381	None		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Anything beyond short demonstration up to and including 30 days		
TURBINE INSPECTOR	(engine & turbine)	609.381	Learn to use vibrascope.		
INSPECTOR, FLOOR	(mach. shop)	609.381	Learn to test parts using specialized testing equipment.		
PROPELLER INSPECTOR	(ship & boat bldg. & rep.)	609.381	Learn verification of machine set-ups.		
MAJOR-ASSEMBLY INSPECTOR	(agric. equip.)	806.381	Become familiar with farm machinery.	Lower	Good
FINAL INSPECTOR, TRUCK TRAILER	(auto. mfg.)	806.381	Become familiar with truck assemblies.	Lower	INA
			Over 3 months up to and including 6 months		
INTERNAL-COMBUSTION-ENGINE INSPECTOR	(engine & turbine)	806.281	Learn performance requirements of internal combustion engines and function of engine parts.	Lower	Good
Diesel-Engine Inspector	(engine & turbine)	806.281	" "		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 3 months up to and including 6 months		
Gasoline Engine Inspector	(engine & turbine)	806.281	Learn performance requirements of internal combustion engines and function of engine parts.		
HULL INSPECTOR	(ship & boat bldg. & rep.)	806.281	Become familiar with boats. Responding employers generally feel that in the cases of small crafts or pleasure boats the transfer would be possible but in the case of ocean spanning vessels the transfer would not be likely unless the individual had a marine oriented background.	Higher	Indeterminate
OUTSIDE-PRODUCTION INSPECTOR	(aircraft mfg.)	806.381	Learn techniques of inspection related specifically to airplanes.		

Defense Job Title: INSPECTOR, SAMPLE LAYOUT

Inspects raw stock, castings, and forgings processed by vendors to insure conformance to specifications and plans layouts for machining of parts: (1) Inspects items prior to machining: Compares numbers on sample parts with serial numbers to insure that part numbers coincide with allotment numbers. Reads blueprints to determine size and configuration of part specifications for forging, casting, or raw stock. Measures dimensions of part or stock to insure conformance to specifications, using measuring devices, such as height gages, micrometers, and dial indicators. Verifies accuracy of compound angles, using protractors, sine bars, and rotabs. Inspects interior and exterior of parts for cracks and voids. (2) Lays out dimensions of part to be machined from casting, forging, or raw stock: Reads blueprints of part to be superimposed on casting or forging to determine characteristics, such as dimensions and tolerances. Plans layout of parts involving three-dimensional projection of reference points and precision coordination of multiple planes, applying knowledge of coordinate systems and true position tolerancing theory. Verifies accuracy of layout by performing measurement of projected dimensions, using surface plate measurement and rotabs. Determines whether plans for machining are feasible based on knowledge of dimensions of sample, dimensions of part to be machined, machine shop practices, and characteristics of metals. Accepts or rejects sample and prepares documentation describing layout procedures and justifying final decision.

D.O.T. Conversion: INSPECTOR ROUGH CASTINGS (found.) 600.281

INSPECTOR, SAMPLE LAYOUT (Continued)

Starting Hourly Wage Rate For Defense Occupation.....$3.49

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
INSPECTOR, METAL FABRICATING	(any ind.)	619.281	None		
			Over 30 days up to and including 3 months		
INSPECTOR, SET-UP AND LAY-OUT MAN	(mach. shop)	601.281	Learn to draw patterns and templates. Learn techniques of measuring hardness and surface finish.		
			Over 3 months up to and including 6 months		
INSPECTOR, TOOL	(mach. shop)	601.281	Become oriented to working with dies. Learn to use hardness tester and optical comparator. Learn to adjust inaccurate gages.		

Defense Job Title: INSPECTOR, SHIPPING

Inspects the packing and packaging of missile components, assemblies, and testing equipment to insure conformance with company and customer specifications: (1) Verifies articles to be shipped: Reads identification tags to insure that serial numbers on units coincide with numbers on parts list. Reads documentation to insure that unit has been functionally tested and meets standards, and that documentation has been completed in accordance with specifications: (2) Observes workers preparing units for shipment: Observes workers applying liquid preservative to delicate instrumentation and measures area covered by preservative, using calipers and micrometers, to insure adherence to specifications. Observes workers while they position unit in pre-shaped plastic foam padding and place padded units in boxes or crates, to detect deviations from prescribed packaging standards. Examines positioning of other padding, such as corrugated cardboard and excelsior, containers to insure that the type and amount specified is used. (3) Inspects loading of missiles onto vehicles. Observes type, assembly, and position of ramps leading to vehicle to insure against damage to the missile during loading process. Inspects padding and bracing on vehicle transport for specified thickness and positioning. Examines holding cleats, ropes, cables, and supports to insure correct degree of tautness. (4) Compares information on shipping orders and documentation accompanying products with specifications to verify disposition of products and conditions of shipping. (5) Occasionally performs related duties: Visits plants of vendors engaged in manufacturing containers and inspects materials, construction, and dimensions of finished containers for conformance with specifications. Inspects articles being held for shipment and reads accompanying documentation to ascertain shelf life and humidity requirements. Returns items to production areas or vendors as required.

D.O.T. Conversion: None 920.384

INSPECTOR, SHIPPING (Continued)

Starting Hourly Wage Rate For Defense Occupation.....$3.29

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 30 days up to and including 3 months		
PRESERVATION-PACKING SPECIALIST	(any ind.)	199.387	Learn to apply knowledge of packing and packaging techniques in developing specifications and standards for selecting protective or preservative material.		
INSPECTOR, PACKAGING MATERIALS	(drug. prep. & rel. prod.)	920.387	Learn to detect flaws in packaging and use of hardness tester.		

Defense Job Title: INSPECTOR, ULTRASONIC-IMMERSION

Conducts a variety of non-destructive tests on metal, plastic, and carbon components used in rocket propulsion systems: (1) Sets up and operates ultrasonic immersion equipment: Selects transducers, search crystals, test blocks, and frequency settings, according to type of material, configuration of parts, and size of defects to be identified. Positions

INSPECTOR, ULTRASONIC-IMMERSION (Continued)

part, such as chamber or casting on test block, manually or using hoist. (When using ultrasonic immersion equipment places part in water filled vat.) Mounts crystal in transducer and secures transducer in scanning unit, using clamps. Adjusts controls that regulate wave length, frequency, and movement of test block and scanning unit according to knowledge of testing procedures. Observes wave patterns on cathode ray tube to identify type, location, and extent of defects, such as delaminations, gas porosity, inclusions and ruptures, based on experience with equipment. Marks area of defect with crayon or stamps items that pass inspection. (2) Conducts dye penetrant tests on plastic and carbon components: Brushes dye over surface of part and allows dye to penetrate cracks and pores. Wipes excess dye from surface with rag. Brushes premixed developing solution onto part in order to heighten color of dye. Observes configuration of dye filling surface cracks and determines whether part meets specifications, using judgment based on experience. When using fluorescent dye. observes configuration of dye under black light. (3) Conducts alcohol wipe test to determine porosity of carbon parts: Brushes alcohol over surface of part. Positions part on holding device of air drier. Pushes button to start drier that blows warm air over surface of part to evaporate alcohol. Times period of evaporation, using stopwatch. Ascertains porosity of carbon part based on rate of evaporation and knowledge of evaporation characteristics of acceptable parts. (5) Candles fiberglass chamber with other worker to detect weak spots in walls: Turns on 1,000 candle power lamp mounted on swivel and guides beam of light over surface of chamber, or climbs inside chamber and observes walls of illuminated chamber to detect thin spots or cracks. Marks spots with crayon. (6) Records results of non-destructive test on standardized forms and evaluates parts according to results of test and specifications to determine whether parts pass inspection.

D.O.T. Conversion: None 509.387

INSPECTOR, ULTRASONIC-IMMERSION (Continued)

Starting Hourly Wage Rate For Defense Occupation.....$3.48

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 30 days up to and including 3 months		
HARDNESS INSPECTOR	(heat treat.)	504.387	Learn use of hardness tester and Brinell glass.		
Brinell Hardness Tester	(heat treat.)	504.387	Learn use of Brinell tester.		
Rockwell Hardness Tester	(heat treat.)	504.387	Learn use of Rockwell tester.		
Scleroscope Hardness-Tester	(heat treat.)	504.387	Learn use of Sclero-scope.		

Defense Job Title: INSPECTOR, WELDED MODULE ASSEMBLY

Performs in process and final inspection of miniaturized welded module assemblies and components, used in missile fabrication, according to knowledge of electronic and electrical welded module assemblies: (1) Inspects welded module components and assemblies: Reads blueprints and work orders to determine specifications of products. Inspects units, such as resistor boards and diode boards to insure that components, such as diodes, resistors, transistors, and transformers, are positioned and attached as

INSPECTOR, WELDED MODULE ASSEMBLY (Continued)

specified, using micrometers and dial indicators. Inspects color coded wires for conformance with specifications. Pulls wires with fingers and examines soldered joints with magnifying glass to insure that soldering connections secure wires to components at specified location and at prescribed tension. Tests continuity of connections, using a variety of test meters. (2) Inspects welding machine set ups: Reads weld schedules to determine materials and machine settings specified. Observes dials and indicators on machine to determine whether the worker followed set-up instructions or to determine whether correct judgment was used in the selection of variables not specified, according to experience with welding techniques and equipment. Verifies pressure of welding tip on machine, using pressure gage. Approves selection and threading of filler metal, based on knowledge of characteristics of metals and configuration of weld to be produced. Performs pull test to test accuracy of pressure gages, using pneumatic testing device. (3) Inspects welds: Inspects welds to locate defects, such as indentations, expulsion, embedment, surface voids, grooves, and cracks. Inspects dimensions of welds to determine conformance to blueprint requirements, using magnifying equipment, film card reader, handtools, vernier calipers, micrometers, and dial indicators. (4) Inspects molding and potting of assemblies: Observes workers engaged in weighing and mixing ingredients for protective compound to insure that workers follow specified procedures. Observes phases of process, such as positioning parts or assemblies in mold, pouring compound into mold, and placing molds in ovens, to insure that part or assembly is completely covered with coating and cured at specified temperature. (5) Approves acceptable assemblies and welds: Records inspection data on specified forms. Analyzes data to determine whether unit meets standards, applying knowledge of welded module circuits and resistance welding machines. Stamps approved assemblies with identifying data. Prepares report of defects and notifies personnel of assemblies to be reworked.

D.O.T. Conversion: None 726.384

INSPECTOR, WELDED MODULE ASSEMBLY (Continued)

Starting Hourly Wage Rate For Defense Occupation.....$3.10

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
INSPECTOR, SUBASSEMBLIES	(electronics)	726.384	None		

Defense Job Title: INSTRUMENTATION SERVICEMAN "A"

Repairs electromechanical and hydraulic recording instruments, such as pneumatic recorders and oscillographs used in fabricating, inspecting, and testing rocket propulsion systems, using jewelers' handtools and electronic testing equipment: (1) Troubleshoots instruments: Confers with instrument control technicians or reads description of malfunction to obtain data on problems. Operates equipment and observes functions to verify problems. Selects electric testing equipment for testing accuracy of recording instruments according to type of instrument to be repaired. Connects testing equipment leads to recording instruments and turns knobs to send impulse of specified strength through recorder. Reads dials on equipment, applying knowledge of testing and recording instruments. (2) Repairs instruments: Disassembles recording instruments, using jewelers' handtools, such as pliers and modified wrenches. Replaces defective parts, such as pointers, springs, and magnets, as required. Modifies instruments according to written or oral instructions.

INSTRUMENTATION SERVICEMAN "A" (Continued)

Calibrates reassembled instruments, following instructions in instrument reference manuals, and using testing equipment and handtools. (3) Performs routine calibrations on electronic testing equipment such as potentiometers and milliammeters: Compares readings on testing equipment with readings on equipment calibrated according to standards established by the Federal Government in order to determine the accuracy. Adjusts mechanical parts of equipment according to the amount of deviation, using handtools. (4) Occasionally fabricates parts for equipment: Sets up and operates equipment; such as power-driven bench lathes, grinders, and drill presses to fabricate parts for recording instruments undergoing modification.

D.O.T. Conversion: INSTRUMENT REPAIRMAN (any ind.)I 710.281

Starting Hourly Wage Rate For Defense Occupation.....$3.55

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
ELECTRICAL INSPECTOR	(inst. & app.)	710.281	None	Lower	Indeterminate
			Anything beyond short demonstration up to and including 30 days		
ELECTRONIC-SCALE ASSEMBLER AND TESTER	(bal. & scales)	710.281	Learn to assemble and test electronic scale.	Lower	Indeterminate

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			<u>Anything beyond short demonstration up to and including 30 days</u>		
HYDROMETER CALIBRATOR	(inst. & app.)	710.281	Learn use of graduating machine to mark hydrometers.		
GAS-METER REPAIRMAN	(light,heat, & power)	710.281	Learn mechanical parts of positive displacement and orifice gas meters. One responding employer offers a formal training course lasting from 2 to 3 weeks.	Lower	Good
Gas-Governor Repairman	(light,heat, & power)	710.281	" "		
			<u>Over 30 days up to and including 3 months</u>		
METER REPAIRMAN	(any ind.)	710.281	Learn parts of volumetric gas, oil, or water meters, and use of special gages. One responding employer offers a 1 week training course.	Lower	Fair
INSTRUMENT MAN	(aircraft mfg.; air trans.)	710.281	Learn parts of instruments and testing procedures. Responding employers offer formal training courses	No Significant Difference	Good

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 30 days up to and including 3 months		
INSTRUMENT MAN (Continued)	(aircraft mfg.; air trans.)	710.281	ranging from 2 days to 2-3 days per item worked on.		
TAXIMETER REPAIRMAN	(auto. ser.)	710.281	Learn parts of taxicab meters.		
GAS-METER PROVER	(light,heat, & power)	710.281	Learn parts and functions of gas meters. One employer offers a formal training course of 2 to 3 weeks duration.	Lower	Good
INSTRUMENT MECHANIC	(light,heat, & power)	710.281	Learn parts and functions of aircraft instruments.	Lower	Fair
TIN-CASE-METER REPAIRMAN	(light,heat, & power)	710.281	Learn parts of tin-case gas meters and use of soldering iron.	No Significant Difference	Fair
CONTROLLER ADJUSTER	(tobacco)	710.281	Become familiar with functions of nucleonic instruments.		
WATER-METER REPAIRMAN	(waterworks)	710.281	Learn parts and functioning of water meters. One responding employer offers a 1 week formal training course.	Lower	Good

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 3 months up to and including 6 months		
ELECTROMECHANICAL TECHNICIAN	(inst. & app.)	710.281	Learn use of metal-working machines.	No Significant Difference	Indeter-minate

Defense Job Title: INSTRUMENTATION TECHNICIAN "A" (TESTING)

Adjusts and controls electronic and hydraulic data gathering and recording equipment, such as closed television systems, spectrophotometers, and strip chart recorders used in gathering and recording data during the testing of rocket propulsion systems: (1) Balances, tunes, and adjusts measuring equipment in blockhouse: Compares readings on recording instruments with readings on test meters to insure equipment is calibrated to standards of accuracy. Compares specifications on recording equipment listing range and speed of equipment with project plan to insure that equipment has capacity to record results of test. Tests signals and frequencies on electronic equipment to insure that signals are received on specified channels, using voltmeters and oscilloscopes. Turns knobs and screws in accordance with manual directions to adjust synchronization and tuning of electronic measuring instruments. Installs shunts in recording instruments to divert or reduce voltage, using knowledge of reduced voltage systems. (2) Operates instruments during test of propulsion systems: Starts recording instruments manually or turns knob to set timer that automatically starts equipment. Monitors equipment during test and calls out instrument readings during test, as requested. Turns knobs to improve

INSTRUMENTATION TECHNICIAN "A" (TESTING) (Continued)

reception of equipment such as television systems, tape recorders, and amplifiers. Removes graphs from recording instruments at conclusion of test and replaces paper in machine. Labels graphs according to type of data, frequency, and equipment.
(3) Inspects instrumentation system between rocket transducers and blockhouse prior to test: Tests continuity of electrical circuits using testing equipment, such as meggers and voltmeters. Inspects devices, such as relay switches and servomechanisms to insure that devices function according to specifications. Compares wiring in junction box with blueprints and diagrams to insure that installation corresponds with plans. Installs temporary wiring using electricians' handtools. Locates faulty parts and circuitry, applying knowledge of electrical systems, and using electronic testing equipment.

D.O.T. Conversion: None 828.381

Starting Hourly Wage Rate For Defense Occupation.....$3.55

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Anything beyond short demonstration up to and including 30 days		
INSPECTOR, SYSTEMS	(electronics)	722.281	Learn particular system and use of precision measuring instruments. Two responding employers indicate a formal company training course ranging from 1 week to 1 month in duration.	Lower	Indeterminate

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 30 days up to and including 3 months		
ELECTRONIC-SCALE ASSEMBLER AND TESTER	(bal. & scales)	710.281	Learn assembly of scale and use of variac.	Lower	Indeterminate
			Over 3 months up to and including 6 months		
TESTER, SYSTEMS	(electronics)	729.381	Learn to construct test circuits, replace wiring and components, and perform functional tests.	No Significant Difference	Indeterminate
ELECTRONICS MECHANIC	(any ind.)	828.281	Learn diagnosis and repair of malfunctions, applying knowledge obtained from experience with electronic instruments.	Lower	Indeterminate

Defense Job Title: JIG AND FIXTURE BUILDER

Lays out, fabricates, assembles, and repairs standard and non-standard jigs, fixtures, gages, and tool masters used in the production of missile parts, using handtools, machine tools, and precision optical and mechanical measuring instruments: (1) Lays out work: Reads blueprints and design drawings to determine sequence of operations and metal stock to be used. Marks center point and lines of reference on ferrous and non-ferrous metal, alloys, plastic, and wood stock, using layout tools, such as scribers, dividers, and straightedge. Computes location of lines of reference, compound angles and contours, and center point, applying knowledge of shop mathematics and trigonometry. (2) Fabricates parts: Sets up and operates drill press to drill, tap, ream, and counter-bore holes in missile jigs and fixtures. Grinds surfaces of missile jigs and fixtures to exacting tolerances, using pedestal and disk grinders. (3) Assembles parts: Positions and secures parts on surface table (tooling dock), using V-blocks, vises, and clamps. Installs standard hardware, such as hinges and casters and assembles parts of finished jigs and fixtures, using handtools, such as hammers, wrenches, and screwdrivers. Verifies conformance to blueprint specifications and the coordination and fit of jig assemblies and masters, using precision optical instruments, such as spectrometer, photospectrometer, heliostat, transit, collimator and theodolite, and mechanical precision measuring instruments, such as micrometer, height and surface gages, vernier calipers, and dial indicators. (4) Prepares sketches: Prepares rough shop drawings and design sketches, using straightedge, protractor, and rule to indicate jig coordination and alinement requirements. Computes and records angles and dimensions, applying knowledge of geometry and trigonometry.

D.O.T. Conversion: TOOL MAKER, BENCH (mach. shop) 601.281

JIG AND FIXTURE BUILDER (Continued)

Starting Hourly Wage Rate For Defense Occupation.....$3.64

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
TOOL MAKER, BENCH	(D.O.T. Conversion)				
Gage Maker	(mach. shop)	601.281	None		
Jig-And-Fixture Maker	(mach. shop)	601.281	None		
Tool Repairman, Bench	(mach. shop)	601.281	None		
			Over 30 days up to and including 3 months		
INSPECTOR, ROUGH	(found.)	600.281	Learn foundry inspection process.		
INSPECTOR, GAGE	(mach. shop)	601.281	Become familiar with inspection process and lapping.		
INSPECTOR, SET-UP AND LAY-OUT MAN	(mach. shop)	601.281	Learn to draw patterns and templates and improve layout procedures.		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 30 days up to and including 3 months		
INSPECTOR, TOOL	(mach. shop)	601.281	Learn inspection processes and methods. Two responding employers indicate a formal company training course ranging in duration from 3 months to 2 years.	Lower	Good
INSPECTOR, FLOOR	(mach. shop)	609.381	Learn inspection processes and methods.		
			Over 3 months up to and including 6 months		
MACHINE BUILDER	(mach. mfg.; mach. tools & access.)	600.281	Become familiar with machine assembly and welding process. Some responding employers indicate company sponsored training course ranging from 6 months to 3 years.	Lower	Good

Defense Job Title: LABORATORY TECHNICIAN, SENIOR (CHEMICAL)

Conducts laboratory tests to determine the chemical and physical properties of metallic and non-metallic materials used in missiles: (1) Prepares equipment for test: Reads test procedures or confers with scientific personnel to determine type, sequence and standards of test to be conducted. Prepares samples of products for analysis, such as liquid and solid fuels, oxidizers and bonding agents using standard laboratory apparatuses. Tests samples, applying techniques of qualitative and quantitative chemistry to determine the nature of chemical changes that occur during combustion. Tests new materials for tensile strength, bonding characteristics, and other stress properties, using high temperature ovens and special freezing equipment. Observes progress of experiment visually or reads dials of measuring instruments and records data in log for further analysis. (2) Prepares documentation: Evaluates validity of data and experimental findings relative to aims of study, based on knowledge of laboratory test procedures and theoretical chemistry. Prepares reports on test results. (3) Performs related duties: Blows glass to form apparatus, such as tubing or retorts using techniques of blowing glass.

D.O.T. Conversion: CHEMICAL-LABORATORY TECHNICIAN (profess. & kin.) 022.281

Starting Hourly Wage Rate For Defense Occupation.....$3.54

Counterpart Occupations D.O.T. Titles	D.O.T Industrial Desigantion	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 30 days up to and including 3 months		
CHEMIST, WATER PURIFICATION	(waterworks)	022.281	Learn techniques of sampling water to determine content and to identify contaminants.		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 30 days up to and including 3 months		
LABORATORY TESTER I	(any ind.)	029.281	Learn to set up and adjust laboratory equipment, such as grinders, agitators and vibrating screens.		
CONTROL CHEMIST, FOUNDRY	(found.)	029.281	Learn to set up and adjust laboratory equipment, such as carbon determinator, sulfur determinator, spectrophotometer, and titration testing equipment.		
			Over 3 months up to and including 6 months		
TESTER	(petrol. refin.)	029.281	Learn properties of crude oil and petroleum products and testing procedures for their analysis.		

Defense Job Title: LABORATORY TECHNICIAN, SENIOR (MATERIALS)

Applies knowledge of mechanical engineering to test stress properties of materials used in missiles for conformance to specifications, under direction of engineering personnel: (1) Plans test methodology: Confers with engineering personnel or reads project specifications to determine material to be tested, test objectives, and product stress requirements. Selects test equipment, such as vacuum melter furnaces and induction heaters, based on knowledge of test objectives and test equipment or devises test equipment based on ingenuity and experience with test equipment. Plans sequence of destructive and nondestructive tests to determine whether metal, plastic, or glass material meets standards, applying knowledge of material testing procedures gained while working in laboratory. (2) Prepares equipment for tests and tests materials. Prepares specimen for analysis by cutting it to size and grinding it to specified thickness, using power-driven saws and grinders. Mounts specimens on equipment, such as tensile and torsion testing devices, using clamps or clips, or positions specimen on equipment table. Connects electronic measuring and recording equipment and power source to test apparatus, using leads and plugs. Starts equipment, such as vacuum pumps or air compressors, to create specified test conditions. Reads dials and automatically recorded line graphs, and posts data on log. Photographs critical points of materials tested, such as the fraying of glass fibers under torsion, and develops negatives for subsequent use by engineering personnel. Examines specimen to determine crystal structure of metals or curvature of non-metals before and after testing, using electron microscope. Sets up and operates ultrasonic inspection equipment to detect surface irregularities, such as cracks or voids caused by testing procedures. (3) Analyzes data: Reduces raw data collected from log and graphs to usable form by applying standard mathematical formulas to data. Plots data on graph, as required, applying knowledge of coordinate system. Analyzes results of test relative to material specifications to determine whether product meets specifications and accepts or rejects material. Prepares description of test methodology, equipment, observations and data following specified format. Submits report to superior for further analysis. (4) Occasionally tests materials submitted by vendors to verify conformity to company specifications using standard and special testing equipment.

D.O.T. Conversion: QUALITY-CONTROL TECHNICIAN (profess. & kin.) 019.281

LABORATORY TECHNICIAN, SENIOR (MATERIALS) (Continued)

Starting Hourly Wage Rate For Defense Occupation.....$3.54

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 3 months up to and including 6 months		
MECHANICAL-ENGINEERING TECHNICIAN	(profess. & kin.)	007.181	Learn to develop, fabricate and assemble new or modified mechanical components or assemblies for machinery and equipment, such as power equipment, servo-systems, machine tools and measuring instruments.		

Defense Job Title: LABORATORY TECHNICIAN, SENIOR (WELDING AND BRAZING)

Sets up and operates arc and electron beam welding machines that automatically weld samples of metal stock and rocket parts and records specifications, such as machine settings, special welding techniques, and type of filler material, to develop set-up data for use by engineering personnel in determining welding procedures in production

LABORATORY TECHNICIAN, SENIOR (WELDING AND BRAZING) (Continued)

activities: (1) Sets up and operates automatic arc welding equipment: Reads work orders and blueprints to ascertain such factors as configuration of workpiece and welding processes and filler rod to be used. Turns knobs on control panel to adjust polarity, amperage, voltage, wire feed rate, slope rate, rate of travel, and current source settings according to knowledge of characteristics of metal and welding process. Clamps workpiece onto holding fixture. Turns handwheels to aline electrode, mounted on overhead unit, with seam to be welded. Mounts spool of filler metal on spindle and threads wire through feed mechanism. Connects hoses between tank of helium or argon gas and weld unit, or when using submerged arc welding process, fills hopper with flux and positions spout over seam. Starts machine and observes welding action. Examines weld for cracks. Records data pertaining to machine set up on record sheets. Routes workpiece to testing unit for further processing. Reads test results and modifies machine set up to obtain weld of specified standards, during resulting trials. (2) Welds rocket parts, using electric arc welding equipment: Reads work orders to ascertain specifications for filler metal, process, and equipment settings or selects methods and materials according to job knowledge. Turns knobs to adjust polarity, amperage, and voltage. Selects size and type of electrodes or filler rod according to type of material and size of workpiece and positions them in portable rod holder, torch, or welding gun. Connects cables carrying electric current between welding machine and portable rod holder. When using tig (tungsten inert gas) or mig (metallic inert gas) welding equipment, connects hoses between tanks of helium or argon gas and gun or torch and turns knobs to adjust flow of gas according to specified pressure. Starts equipment and positions welding tool above workpiece to strike arc. Guides tool along workpiece at rate of speed determined by type of metals to be joined and size of lead, to fuse edges of seam with material from filler rod. Routes welded workpiece to testing unit for strength and depth analysis. Records on work sheet, such data as equipment settings, type and size of metal rod and type of gas used. Modifies set up and materials in accordance with test results. (3) Sets up and operates electron beam welding equipment: Sets up equipment by turning knobs to adjust travel speed, milliamps, kilovolts, beam current, focus current and gun filament current according to type of metal and width and depth of desired seam. Positions workpiece on holding fixture and secures it with clamps. Locks door and starts vacuum pump to create vacuum in chamber. Observes dial to ascertain when chamber has been evacuated of air and stops pump. Starts equipment that directs electron beam against workpiece. (The ensuing heat converted from electron energy fuses metal to form weld.) Observes

LABORATORY TECHNICIAN, SENIOR (WELDING AND BRAZING) (Continued)

process through leaded glass to ascertain when material has fused. Periodically changes tantalum filament, using handtools. Measures distance between filament and anode with depth micrometer to insure that filament is positioned as specified. (4) Brazes workpiece: Reads work orders to ascertain specified torch, flux, and filler metals. Positions workpiece on fixture and secures it with clamps. Connects hoses to tanks of oxygen and acetylene gas and torch. Turns handles to start flow of gas. Adjusts gas mixture according to size and color of flame and readings on flowmeter. Brushes flux on filler rod to prevent oxidation. Guides torch and filler metal rod along seam, regulating speed according to type of thickness of metal to be joined to heat workpiece to brazing temperature and bond workpieces. Fuses metals having brazing temperatures between 1200 degrees and 1700 degrees Fahrenheit using silver soldering techniques. (5) Joins metals with a solder that melts below 500 degrees Fahrenheit when necessary to prevent warping of workpiece caused by high temperatures, using soldering iron and techniques of soldering.

D.O.T. Conversion: None 819.380

Starting Hourly Wage Rate For Defense Occupation.....$3.54

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
WELDING-MACHINE OPERATOR, ARC	(welding)	810.782	None		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
WELDING-MACHINE OPERATOR, GAS-SHIELDED ARC	(welding)	810.782	None		
Tungsten-Welding-Machine Operator, Inert Gas	(welding)	810.782	None		
WELDING-MACHINE-OPERATOR, SUBMERGED ARC	(welding)	810.782	None		

Defense Job Title: LABORATORY TEST INSTRUMENTATION TECHNICIAN

Applies knowledge of electronic theory and testing methods and apparatus in order to instrument missile components for environmental tests: (1) Selects and prepares testing apparatus: Confers with engineering personnel and reviews written instructions to determine variability of parameters being measured, transducers to be used, and type of test being conducted, such as structural loading under high temperature and vibration, high altitude simulation, deep sea submergence simulation, and accoustical noise environment. Selects measuring and readout devices, such as oscillographs, X-Y plotters, oscilloscopes, multi-channel recorders, voltmeters, ammeters, multi-channel digital data acquisition systems, servo analyzers, and pressure and flow measuring devices, according to knowledge of parameters to be tested and testing apparatus capacities. Connects power sources with designated testing, measuring, and recording apparatus, using cables, plugs, leads, and clamps. Verifies accuracy of calibrated recording instruments by observing reaction of dials, wave forms, and print out to electronic stimulus of known strength. Tunes test apparatus, following manufacturers' instructions. (2) Prepares components for testing: Cleans surface of component where transducer is to be mounted, using solvents. Alines transducers, such as strain gages, potentiometers, thermocouples, and piezo-electric accelerometers, at designated surfaces on component, using special alining handtools and measuring devices. Glues transducer to component. Constructs test circuitry (cluges, kluges) to connect transducers to measuring and recording equipment, according to knowledge of circuitry, recording equipment, and test procedures, and using electricians' handtools and soldering irons. (3) Monitors testing apparatus: Monitors recording instruments mounted on console during tests of structural components conducted by other workers, to insure that instruments function according to standards. Inspects circuitry, transducers, and cables to locate causes of inaccurate recordings or readings. (4) Gives work directions to other workers: Assigns tasks to workers based on workload and level of skill. Draws schematic diagrams of test circuitry to be used by subordinates during layout of test apparatus. Explains and demonstrates techniques of constructing circuitry and positioning transducers on components to trainees. (5) Occasionally performs related duties: Fabricates test fixtures and laboratory aids from wood, plastics, or metal, using tools, such as saws, woodworking tools, disk grinders, drill presses, sheet metal shears and power brake. Calibrates deflection meter, used to test shrouds, using Jo blocks and precision test bridge. Verifies position of transducer attached to surfaces of structural components for conformance to specifications, using gages.

D.O.T. Conversion: None 003.281

LABORATORY TEST INSTRUMENTATION TECHNICIAN (continued)

Starting Hourly Wage Rate For Defense Occupation.....$3.64

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 30 days up to and including 3 months		
INSTRUMENTATION TECHNICIAN	(profess. & kin.)	003.281	Become familiar with equipment being tested.		

Defense Job Title: LABORATORY TEST MECHANIC

Fabricates test stands and holding fixtures, using sheet metal fabricating machines, and installs test stands, holding fixtures, and missile systems, components, and materials in environmental testing equipment, such as vibrator, centrifuge, and impact and shock tester: (1) Lays out work: Reviews assembly blueprints and incomplete engineering sketches to ascertain type of test stands and holding fixtures required. Marks cutting and bending lines and coordinating points on sheet metal, applying knowledge of algebra and trigonometry, and using layout tools, such as scriber, straightedge, and protractor. (2) Fabricates test stands and holding fixtures: Sets up and operates sheet metal fabricating machines, such as roll, brake, and shear to bend, cut, and shape sheet metal into test fixtures and support hardware, such as stiffeners and brackets. Measures fabricated part to assure conformance to blueprint specification, using precision measuring instruments, such as micrometers, calipers, and gages. (3) Installs fixtures, test stands, and

LABORATORY TEST MECHANIC (Continued)

missile systems, components, and materials in test equipment: Bolts test stand and holding fixture to environmental testing equipment, following laboratory test procedures. Bolts missile systems, components, and materials to test fixture, using wrench. Connects items being tested to equipment or instruments, such as oscilloscope, load simulator, and electric meters, according to instructions of technical and engineering personnel, and applying knowledge of electronic laboratory test equipment. (4) Occasionally installs and reworks components: Occasionally installs electrical, mechanical, and fluid components in missiles undergoing laboratory tests, following blueprint specifications. Occasionally disassembles and reworks faulty components of mechanical, hydraulic, or electric systems, using mechanic's or electricians' handtools.

D.O.T. Conversion: None 621.381

Starting Hourly Wage Rate For Defense Occupation.....$3.12

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 3 months up to and including 6 months		
FLIGHT-TEST SHOP MECHANIC	(aircraft mfg.)	621.381	Learn various types of mechanical and electrical flight testing equipment for aircraft.		

Defense Job Title: LABORATORY TEST TECHNICIAN

Conducts laboratory tests of research and developmental missile systems, components, and materials to obtain data necessary for evaluation by engineering personnel, applying knowledge of laboratory testing procedures: (1) Plans tests: Reviews blueprints, wiring diagrams, and engineering sketches to plan sequence of testing activities. Selects test equipment, such as vibrators, altitude simulators, "G" accelerator, impact and shock testers, furnaces and temperature chambers, salt spray cabinets, and hydraulic and pneumatic test benches, according to the type of tests to be performed, such as electrical, fluid dynamics, structures, and mechanics, and applying knowledge of equipment functions. Modifies equipment according to testing requirements. Calibrates test instruments such as oscilloscopes, pressure and flow measuring devices, thermocouples, load simulators, servo analyzers, stress and strain measuring devices, ammeters, and voltmeters. Examines holding fixtures, test stands, and missile systems, components and materials mounted in testing equipment by LABORATORY TEST MECHANICS in order to detect deviations from specific test and safety standards. Corrects deviations or modifies setup of systems as required. (2) Operates test equipment: Turns on test equipment to simulate test flight conditions, such as altitude, vibration, and heat. Turns on test instruments, such as oscillographs, pressure and flow meters, and impedance and inductance bridges, to record test data. Observes readings of dials or indicators and adjusts test equipment controls to obtain required environmental or stress conditions. (3) Collects data: Records readings of test equipment and instruments for analysis by engineering personnel. Assists engineering personnel on the evaluation of test data and suggests design changes of items being tested, applying knowledge of testing procedures. (4) Occasionally devises test fixtures: Improvises new, or modifies used test fixtures, using shop machine, such as saws, grinders, and drill press.

D.O.T. Conversion: None 002.281

LABORATORY TEST TECHNICIAN (Continued)

Starting Hourly Wage Rate For Defense Occupation.....$3.64

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 30 days up to and including 3 months		
SYSTEMS-TESTING-LABORATORY TECHNICIAN	(profess. & kin.)	003.181	Become familiar with testing requirements of various systems and equipment in order to devise and modify test instrumentation.		
INSTRUMENTATION TECHNICIAN	(profess. & kin.)	003.281	Learn procedures for testing mechanical, structural, and electrical equipment.		
Rocket-Control Technician	(profess. & kin.)	003.281	" "		
Environmental Research Technician	(profess. & kin.)	003.281	" "		
			Over 3 months up to and including 6 months		
ELECTRONIC TECHNICIAN	(profess. & kin.)	003.181	Learn testing procedures, report writing techniques and developing charts, graphs, and schematics.		

Defense Job Title: MACHINIST, DUPLICATING AND PROFILING

Sets up electrically and hydraulically controlled automatic duplicating and profiling machine for other workers to mill missile parts, such as o-rings, firing unit housings, and clamp rings: (1) Lays out part: Reviews blueprints to determine sequence of operations and to ascertain part to be duplicated. Lays out reference lines and points on ferrous and non-ferrous stock, such as billets, forgings, castings, extrusions, bar stock, and plastic, according to blueprint specifications, using layout tools, such as scribers, center punches, and dividers. (2) Sets up machines: Clamps workpiece and model to machine bed, using handtools such as wrenches and screwdrivers and applying job knowledge of relationahip between workpiece and model. Selects cutting tool and mounts and fastens it to machine spindle, using wrench. Selects tracing stylus and mounts it on tracing arm of machine applying knowledge of machine capacity and function. Determines, sets, and adjusts machine speeds, feeds, and depth of cut, applying knowledge of machinability of materials, and data from machinists' handbook, tables, and charts. (3) Performs first-run operations: Starts machine. Turns handle to begin automatic machine operations. Observes machine operations and makes adjustsments to assure conformance of workpiece to specifications. Verifies conformance to blueprint specifications, using precision measuring instruments, such as dial indicators, micrometers, calipers, protractors, and height gages. (4) Grinds tools: Operates bench grinder to sharpen cutting tools, such as bits, drills, and tracers.

D.O.T. Conversion: JOB SETTER (mach. shop) 600.380

Starting Hourly Wage Rate For Defense Occupation.....$3.42

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 30 days up to and including 3 months		
SET-UP MAN, PLASTICS	(mach. shop)	600.380	Learn to set up and adjust modified metal working and woodworking machines, and to machine plastic stock.		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Desiqnation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 3 months up to and including 6 months		
MACHINIST I	(mach. shop)	600.280	Learn to set up and operate all machine tools.		
MACHINIST, EXPERIMENTAL	(mach. shop)	600.280	Learn to fabricate experimental parts and develop production procedures.		
MAINTENANCE MACHINIST	(any ind.)	600.280	Learn to diagnose malfunction in industrial machines and make and install replacement parts.		
Machinist, Construction Equipment	(any ind.)	600.280	" "		
MACHINE SET-UP OPERATOR	(mach. shop)	600.380	Learn to set up and operate machine tools.		
MACHINE TRY-OUT MAN	(mach. shop)	600.380	Learn to set up and operate prototype metalworking machines.		
Honing-Machine Try-Out Man	(mach. shop)	600.380	Learn to set up and operate honing machine.		

Defense Job Title: MACHINIST, JIG BORER

Sets up and operates jig boring machine to drill, bore, and ream holes in metal tools, dies, jigs, and fixtures used in fabricating missile parts, applying knowledge of tooling procedures: (1) Lays out work: Reads blueprints to determine the sequence of operation, location of holes in workpiece, and methods of securing workpiece. Marks lines of reference and location of holes on workpiece, applying shop mathematics, geometry, and trigonometry, and using layout tools, such as scriber, center punch, and divider. (2) Sets up machine: Secures workpiece to bed of machine using bolts, clamps, wrenches, shims, and blocks, and applying knowledge of methods used to prevent warpage of workpiece. Selects cutting tool, applying knowledge of machinability of metals. Mounts tool on machine spindle, using wrench. Positions table, and sets machine speeds, feeds, and stops, applying data from machinist's handbook, and charts. (3) Operates machine: Starts machine. Directs flow of coolant over workpiece. Turns handle to feed rotating tool to workpiece. Verifies location and dimensions of holes, using precision measuring instruments, such as depth and surface gages, dial indicators, center scope, sine bars, and micrometers. Records machine setting on charts after each machine operation for reference by subsequent production machine operators. (4) Sharpens tools: Operates bench grinder to sharpen tools and bits.

D.O.T. Conversion: BORING-MACHINE SET-UP OPERATOR, JIG (mach. shop) 606.280

Starting Hourly Wage Rate For Defense Occupation.....$3.42

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Anything beyond short demonstration up to and including 30 days		
DRILL-PRESS SET-UP OPERATOR, MULTIPLE SPINDLE	(mach. shop)	606.380	Learn machine set-up and operation.		

Defense Job Title: MACHINIST, LATHE

Sets up and operates a variety of machine shop lathes to turn ferrous and non-ferrous metal missile parts, such as bracket, o-rings, and clamp rings to exacting tolerances according to blueprint specifications: (1) Lays out work: Examines blueprints, sketches, and templates to determine sequence of operations, cutting tools to be used, and methods of holding work. Lays out lines and points of reference on workpiece to use as reference during machining operations, using layout tools, such as scribers, center punches, and dividers, and applying knowledge of most economical use of material. (2) Sets up machine: Mounts and centers workpiece on machine chuck, collet, or face plate, using chuck-wrench or screwdriver. Selects, mounts, and fastens cutting tools in toolpost, applying knowledge of material being machined and finish desired. Determines machine speeds and feeds, considering data from handbook, tables, and charts. Operates machine on trial run and adjusts machine to insure conformance to specifications. (3) Operates lathes: Starts machine: Turns controls to feed tool against workpiece. Measures work to insure conformance to blueprint specifications, using precision measuring instruments, such as plug gages, telescope gages, calipers, and micrometers. (4) Grinds tools: Operates bench grinder to sharpen cutting tools, such as bits and drills.

D.O.T. Conversion: ENGINE-LATHE SET-UP OPERATOR (mach. shop) 609.380

Starting Hourly Wage Rate For Defense Occupation.....$3.42

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
ENGINE-LATHE SET-UP OPERATOR	(D.O.T. Conversion)				
Tracing-Lathe Set-Up Operator	(mach. shop)	609.380	Learn to set up and operate tracing lathe.		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Anything beyond short demonstration up to and including 30 days		
DRILL-PRESS SET-UP OPERATOR, RADIAL	(mach. shop)	606.380	Learn machine set-up and operation.		
			Over 30 days up to and including 3 months		
BORING-MILL SET-UP UP OPERATOR, HORIZONTAL	(mach. shop)	606.280	Learn machine set-up and operation.		
DRILL-PRESS SET-UP OPERATOR, RADIAL, TOOL	(mach. shop)	606.380	Learn machine set-up and operation.		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 30 days up to and including 3 months		
SCREW-MACHINE SET-UP OPERATOR, MULTIPLE SPINDLE JOBBING	(mach. shop)	604.280	Learn to set up and operate multiple-spindle lathe-type screw machines.		
SCREW-MACHINE SET-UP OPERATOR, SINGLE, SPINDLE JOBBING	(mach. shop)	604.280	Learn to set up and operate single-spindle lathe-type screw machines.		
CHUCKING-MACHINE SET-UP OPERATOR	(mach. shop)	604.380	Learn to set up and operate single- or multiple spindle horizontal chucking machines.		
CHUCKING-MACHINE SET-UP OPERATOR MULTIPLE-SPINDLE, VERTICAL	(mach. shop)	604.380	Learn to set up and operate multiple-spindle vertical chucking machines.		
SET-UP MAN, AUTOMATIC-SPINNING-AND-BEADING-LATHE	(mach. shop)	604.380	Learn to set up automatic spinning lathe equipped with slitter or knife, and beading rolls.		
TURRET-LATHE SET-UP OPERATOR	(mach. shop)	604.380	Learn to set up and operate turret lathes.	Lower	Fair

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 3 months up to and including 6 months		
ENGINE-LATHE SET-UP OPERATOR, TOOL	(mach. shop)	604.280	Learn to set up and operate turret lathe to fabricate machine, tool, and die parts.		
SCREW-MACHINE SET-UP MAN, MULTIPLE SPINDLE, JOBBING	(mach. shop)	604.280	Learn to set up multiple spindle lathe-type screw machines.		
SCREW-MACHINE SET-UP MAN, SINGLE SPINDLE, JOBBING	(mach. shop)	604.280	Learn to set up single-spindle lathe-type screw machines.		
TURRET-LATHE SET-UP OPERATOR, TOOL	(mach. shop)	604.280	Learn to set up and operate turret lathe to fabricate machine, tool, and die parts.	No Significant Difference	Fair
Chucking-Machine Set-Up Operator, Tool	(mach. shop)	604.280	Learn to set up and operate chucking machine to fabricate machine, tool, and die parts.		
Screw-Machine Set-Up Operator, Tool	(mach. shop)	604.280	Learn to set up and operate screw machine, to fabricate machine, tool, and die parts.		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 3 months up to and including 6 months		
Turret-Lathe Set-Up Operator, Tool, Vertical	(mach. shop)	604.280	Learn to set up and operate turret lathe to fabricate machine.		
CHUCKING-MACHINE SET-UP MAN	(mach. shop)	604.380	Learn to set up single or multiple-spindle chucking machines.	No Significant Difference	Good
LATHE SET-UP MAN	(mach. shop)	604.380	Learn to set up and operate a variety of lathes for production workers.		
SCREW-MACHINE SET-UP MAN, PRODUCTION	(mach. shop)	604.380	Learn to set up single- or multiple-spindle lathe-type screw machines.	No Significant Difference	Good
SET-UP MAN, AUTOMATIC SPINNING LATHE	(mach. shop)	604.380	Learn to set up automatic spinning lathe.		
TURRET-LATHE SET-UP MAN	(mach. shop)	604.380	Learn to set up turret lathes.		
THREADING MACHINE SET-UP MAN	(mach. shop)	609.380	Learn to set up single- or multiple-spindle threading machines.	No Significant Difference	Poor

Defense Job Title: MACHINIST, MILLING MACHINE

Sets up and operates universal, horizontal, or vertical power feed milling machine to machine missile parts, such as rocket stands, clamp rings, and firing unit housings: (1) Lays out work: Studies blueprints, sketches, and templates and plans sequence of operations. Lays out lines and points of reference on workpiece as guide during machine operations and to make most economical use of workpiece, using layout tools, such as scribers, dividers, and center punches. (2) Sets up machine: Clamps workpiece to machine bed, applying knowledge of material used to prevent warpage, using wrenches and standard, improvised, and adapted fixtures. Selects cutting tool and mounts it on machine spindle, using wrench. Determines machine feed, speed, and depth of cut, applying knowledge of materials used and information in machinists' handbook, charts and tables. (3) Operartes machine: Starts machine. turns handle to feed workpiece to cutting tool and engages automatic feed. Verifies conformance of workpiece to blueprint specifications, using precision measuring instruments, such as micrometers, calipers, scales, dial indicators, surface gages, adjustable parallels, bevel protractors, gage blocks, and sine plates and bars. (4) Grinds tools: Operates bench grinder to sharpen cutting tools and drill bits.

D.O.T. Conversion: MILLING-MACHINE SET-UP OPERATOR (mach. shop) 605.782

Starting Hourly Wage Rate For Defense Occupation.....$3.42

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only.		
STEEL-WOOL-MACHINE OPERATOR, AUTOMATIC	(abrasive & polish. prod.)	605.782	None		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
ROUTER OPERATOR	(aircraft mfg.)	605.782	None		
ROUTER OPERATOR, RADIAL	(aircraft mfg.)	605.782	None		
BARREL-RIB MATTER	(firearms)	605.782	None		
BROACHING-MACHINE OPERATOR, PRODUCTION	(mach. shop)	605.782	None		
SCALPER OPERATOR	(nonfer. metal alloys)	605.782	None		
			Anything beyond short demonstration up to and including 30 days		
KEYSEATING-MACHINE SET-UP OPERATOR	(mach. shop)	605.782	Learn set up and operation of keyseating machine and special keyseating methods and procedures.		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Anything beyond short demonstration up to and including 30 days		
PROFILING-MACHINE SET-UP OPERATOR	(mach. shop)	605.782	Learn to set up and operate milling machine equipped with built-in or attached tracing mechanism.		
SHAPER SET-UP OPERATOR, TOOL	(mach. shop)	605.782	Learn to set up and operate shapers that reciprocate bar tool against stationary workpiece to plane, shape, or groove workpieces.	Lower	Good
THREAD-MILLING-MACHINE SET-UP OPERATOR	(mach. shop)	605.782	Learn to set up and operate thread-milling machine. Learn positioning of cutting tools and installation of gears, cams, and stops.		
			Over 30 days up to and including 3 months		
BROACHING-MACHINE SET-UP OPERATOR	(mach. shop)	605.782	Learn to set up and operate internal or external broaching machines cylindrical or flat surfaces of metal workpieces.	Lower	Poor

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 30 days up to and including 3 months		
ENGRAVER, TIRE MOLD	(mach. shop)	605.782	Learn to set up and operate cam-controlled tread-engraving machine to mill tread designs in metal molds for rubber tires. Learn various adjusting actions according to movement and resistance of machine controls.		
PANTOGRAPH-MACHINE SET-UP OPERATOR	(mach. shop)	605.782	Learn to set up and operate pantograph-milling machines. Learn to control cutting action of tool according to various stimuli.		
PLANER SET-UP OPERATOR, TOOL	(mach. shop)	605.782	Learn to set up and operate planers that reciprocate workpieces against stationary bar tools.		
GRINDER SET-UP OPERATOR, THREAD	(mach. shop)	609.782	Learn to set up and operate thread grinding machines. Learn to dress wheel using dressing device.	No Significant Difference	Good
MULTI-PURPOSE-MACHINE OPERATOR TAPE CONTROL	(mach. shop)	609.782	Learn to set up and operate tape controlled metal-cutting machines.		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 30 days up to and including 3 months		
Milwaukee-matic Operator	(mach. shop)	609.782	Learn to set up and operate tape controlled metal-cutting machines.		
TAPE-CONTROL MACHINE OPERATOR	(mach. shop)	609.782	Learn to set up and operate magnetic- or punched- tape controlled machine tools.	Lower	Good

Defense Job Title: MACHINIST, PRECISION RESEARCH

Sets up and operates metal working machines to fabricate precision missile parts, such as gear trains, gyros, scale models, and sub-miniature parts: (1) Lays out work: Examines blueprints, sketches, templates, and master models and confers with company personnel to determine material and machine to be used, sequence of operations, and most economical method of machining part. Suggests methods to be used to engineering and technical personnel and obtains approval. Marks lines of reference, center point, and angular and linear dimensions on metal or plastic stock, or sheet metal workpiece, using layout tools, such as scribers, dividers, and center punches, and applying knowledge of advanced shop mathematics; machine shop theory, practice, and procedures; and sheet metal operations. (2) Sets up machine: Clamps workpiece to mounting fixture or bed of brake, roll, shear, horizontal boring mill, jig boring machine, engine lathe, milling machine, or precision grinder, using handtools, such as wrenches, pliers, or screwdriver. Determines

MACHINIST, PRECISION RESEARCH (Continued)

machine speed, feed, and depth of cut, applying knowledge of machinability of metals, and using machinist's handbook, charts, and graphs. (3) Operates machine. Turns handle to feed workpiece, such as ferrous and non-ferrous metals, alloys, plastics, hard rubber, and unproven materials to rotating cutting tool. Measures workpiece to assure conformance to blueprint specifications, using precision measuring instruments, such as gages, vernier calipers, and micrometers. (4) Fits and assembles parts: Assembles parts, such as gear assemblies and linkage assemblies on workbench according to assembly blueprint specification, using handtools, such as wrenches, sheet metal snips, pliers, saws, screwdrivers, and levels, and power machines, such as drill press, portable drill, sheet metal power fabricating machines, and engraving machine. (5) Sharpens cutting tools and parts: Sets up and operates grinding machine to sharpen machine cutting tools and missile parts.

D.O.T. Conversion: MACHINIST I (mach. shop) 600.280

Starting Hourly Wage Rate For Defense Occupation.....$3.74

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
MACHINE SET-UP OPERATOR	(mach. shop)	600.380	None		
			Over 30 days up to and including 3 months		
MAINTENANCE MACHINIST	(any ind.)	600.180	Learn to repair industrial machines by repairing parts,		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 30 days up to and including 3 months		
MAINTENANCE MACHINIST (Continued)	(any ind.)	600.180	or making machine parts and installing them.		
MACHINIST, EXPERIMENTAL	(mach. shop)	600.280	Learn to make experimental parts, tools, and mechanisms to establish machine settings, product specifications, and fabrication methods.		
			Over 3 months up to and including 6 months		
JOB SETTER	(mach. shop)	600.380	Learn set up requirements for various production machines.		

Defense Job Title: MEASUREMENT STANDARDS LABORATORY TECHNICIAN

Calibrates electronic testing equipment, utilized in testing of missile electronic systems, using Secondary Standards Measurement Instrumentation: (1) Tests accuracy of

MEASUREMENT STANDARDS LABORATORY TECHNICIAN (Continued)

electronic testing equipment: Reads documentation accompanying testing equipment, such as waveform generators, oscilloscopes, counters, and power supplies, to ascertain whether equipment is scheduled for periodic calibration or if it has malfunctioned. Reads calibration procedures established by National Bureau of Standards or engineering personnel to determine equipment settings, sequence of test, and standards of accuracy. Selects methods of testing specially designed equipment for which no procedures are available, according to knowledge of electronic testing equipment, calibration techniques, and purpose for which equipment was designed. Connects equipment to be calibrated with secondary standards instrumentation, such as fluke meters, voltage calibrators, frequency standard, and nanovolt source, using plugs. Turns knobs to adjust variables, such as voltage and frequency according to specifications. Turns on equipment and observes dials, screens, and counters on equipment being calibrated and on testing instrumentation. Records data on form. Reduces data to prescribed form by performing computations using specified formulas or using standardized charts and graphs. Analyzes data and applies knowledge of established standards to determine whether equipment is accurately calibrated. (2) Repairs electronic testing equipment: Reads description of malfunction to determine type of malfunction. Reads wiring diagrams, blueprints, schematics, and specifications to ascertain design of circuitry. Tests circuits and components to locate defects using standard electronic testing devices. Replaces faulty components and wiring, using electricians' handtools and soldering iron. (3) Prepares documentation: Records such data as date equipment is calibrated, parts replaced, and degree of accuracy, on instrument log. Stamps label on calibrated equipment with date stamp.

D.O.T. Conversion: STANDARDS LABORATORY TECHNICIAN (aircraft mfg.; electronics) 019.281

MEASUREMENT STANDARDS LABORATORY TECHNICIAN (Continued)
Starting Hourly Wage Rate For Defense Occupation.....$3.74

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 30 days up to and including 3 months		
INSTRUMENTATION TECHNICIAN	(profess. & kin.)	003.281	Learn to devise, set up, and operate electronic instrumentation for use in testing of mechanical, structural, or electrical equipment.		
Rocket-Control Technician	(profess. & kin.)	003.281	" "		
Environmental-Research-Test Technician	(profess. & kin.)	003.281	" "		

Defense Job Title: MECHANIC, DEVELOPMENTAL ROCKET CONTROLS

Assembles and tests components, such as pumps, switches, and valves used in rocket propulsion systems in a research and development unit: (1) Assembles engine: Reads plans and drawings and confers with engineering personnel regarding methods and procedures for

MECHANIC, DEVELOPMENTAL ROCKET CONTROLS (Continued)

assembling rocket. Measures contours and dimensions of component with devices, such as straight edge, compass, and gages to locate position for drilling holes. Selects cutting tool according to size of hole and material to be drilled. Mounts tool in drill press and drills holes in parts. Positions components, such as pumps, switches, ignitors, and valves, in jigs or holding fixtures manually, or using cranes or overhead hoists. Bolts components together, using hand and power driven tools. Brushes adhesive material on plastic parts and fits parts for bonding. Moves assembly to cure oven, using crane or hoist. Selects temperature for bonding of parts, according to knowledge of properties of synthetic materials, such as plastics, resins, and phenolic. Removes assembly from oven after specified period of time. Measures parts with gages, calipers, and inside and outside micrometers to insure that dimensions conform with specifications. Confers with professional personnel regarding selection and installation of plumbing (pipelines). Shapes precut pipe, using pipe bending and pipe flaring equipment and installs lines for actuator, fuel, and oxidizer systems to obtain maximum efficiency from systems, according to knowledge of propulsion system. Installs conduit and electrical connectors, using handtools and following specifications. (2) Balances parts, using Gesholt balancing equipment: Positions part to be balanced, such as gear, rotor, or impeller, on shaft. Starts equipment that rotates part at specified speed and observes part, using strobe light, to locate wobble or uneven weight distribution. Reads dial on indicator to ascertain amount of distortion present. Compares readings with data on chart to ascertain amount of metal removal required to balance part. Grinds part with power-driven handtool to remove metal. Tests part on shaft until it balances to specified tolerance. (3) Tests assembled units, using hydraulic testing equipment: Installs plumbing and connections on testing equipment, according to type of assembly being tested. Attaches testing unit to assembly, using plumbing connections. Connects measuring devices, such as flowmeters, and pressure, temperature, and strain gages to specified parts of assembly. Turns knobs on control board to open valves and regulate the flow of gas or water through assembly to test for leaks or to locate malfunctions under simulated environmental conditions. Observes readings on dials or data recorded on graph and compares readings with specifications to detect deviations. Evaluates performance of assembly based on familiarity with mechanical systems, results of tests, and testing procedures Records test results and evaluations on specified forms.

D.O.T. Conversion: None 806.281

MECHANIC, DEVELOPMENTAL ROCKET CONTROLS (Continued)

Starting Hourly Wage Rate For Defense Occupation.....$3.55

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 30 days up to and including 3 months		
ASSEMBLER, AIRCRAFT, STRUCTURES AND SURFACES	(aircraft mfg.)	806.381	Learn to assemble sections of airplanes. Learn to use rivet gun and tack welding equipment.	Lower	Indeterminate
			Over 3 months up to and including 6 months		
ASSEMBLY MECHANIC, EXPERIMENTAL AIRCRAFT	(aircraft mfg.)	806.381	Learn layout and structure of aircraft in order to install electrical components.	Lower	INA

Defense Job Title: METAL FITTER "A"

Lays out, fits, and alines tubular and sheet metal missile parts in jigs preparatory to welding by other workers, and straightens parts after welding, applying knowledge of the forming characteristics of sheet metal, and using torch to heat parts: (1) Prepares missile part for welding: Reviews assembly blueprints, loft data, sketches, and incomplete engineering information to ascertain sequence of operations. Lays out missile part on table, using hoist. Alines and fits missile parts in jigs and fixtures, applying knowledge of cumulative distortion and strains on assemblies resulting from welding

METAL FITTER "A" (Continued)

process, and using pry bars, wrenches, hammers, and wedges. Scrapes missile part to remove impurities, such as dirt, rust, and slag, using wire brush, portable grinder, steel wool, or hand scraper. (2) Straightens missile parts after welding: Selects tip to be used on heating torch, according to chart specifications. Screws tip on torch, turns handle to start flow of gas and air, and lights torch. Turns handle to adjust mixture of gas and air to obtain flame of specified size and color. Guides torch along surface of missile part to heat it, observing color of part to ascertain when it has been sufficiently heated in order to remove distortion. Straightens assemblies in order to keep parts in alinement and to obtain specified contours, following exacting tolerances. Smooths and shapes sheet metal, using bumper machine. Measures and scribes workpiece to locate holes in parts, using layout tools, and applying knowledge of mathematics and trigonometry. Drills holes to aline parts, using portable drill. Grinds and files rough edges on parts, using hand file or portable grinder. (3) Inspects work: Measures missile part to insure conformance to blueprint specificiations, using straightedge, template, or precision measuring instrument, such as caliper, gage, and micrometer.

D.O.T. Conversion: FITTER (any ind.) 801.281

Starting Hourly Wage Rate For Defense Occupation.....$3.10

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
FITTER I	(D.O.T. Conversion)				
Fitter-Tacker	(any ind.)	801.281	None		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Anything beyond short demonstration up to and including 30 days		
AIRCRAFT MECHANIC, ARMAMENT	(aircraft mfg.)	801.381	Learn assembly procedures for armament and learn functional testing procedure.		
AIRCRAFT MECHANIC, HEAT AND VENT	(aircraft mfg.)	801.381	Learn layout of aircraft and functional testing procedures.		
AIRCRAFT MECHANIC, RIGGING AND CONTROLS	(aircraft mfg.)	801.381	Learn layout of aircraft and procedures for installing control cables. Learn to use tensiometer.		
ASSEMBLER, MINING MACHINERY	(mach. mfg.)	801.381	Learn procedures for assembling mining machinery.		
			Over 30 days up to and including 3 months		
ASSEMBLER, WELDED DUCTS	(aircraft mfg.)	801.381	Learn specifications on cutting, shipping, and fitting together aircraft oil, fuel, air, hydraulic, or pneumatic tubing.		
Pneumatic-Tube Fitter	(aircraft mfg.)	801.381	" "		

Defense Job Title: METALIZER, PLASMA ARC

Sets up and operates plasma arc and conventional metalizing equipment to bond metallic and non-metallic material to rocket components: (1) Sets up plasma arc metalizing equipment: Reads work orders and blueprints to determine area of part to be metalized, thickness of coating to be applied, and length of time part will undergo treatment. Selects pre-punched taped program to control mechanical function of machine, according to experience with factors related to optimal spraying, such as position of spray head in relation to workpiece, and speed of travel of spray unit. Positions tape drum in computer and threads it on spool as specified. Weighs powdered tungsten on gram scale and pours powder in hopper. Clamps lid on hopper and adjusts control to regulate air compression system that pressurizes feed hopper. Places workpiece in oven and adjusts temperature and time controls to preheat parts. Clamps heated workpiece on shaft. (2) Starts motor to rotate part. Starts generator that supplies power for arc. Opens valves that regulate flow of powdered tungsten through liquid nitrogen and an electric arc causing the tungsten to bond to a carbon workpiece. Adjusts size of orifice to regulate spray of tungsten and liquid nitrogen to obtain coating of specified thickness. Pushes button to start computer that controls machine functions, such as traverse of spray head along workpiece, position of spray head in relation to workpiece, and striking of arc. Observes operation of equipment, reads dials on control board measuring variables, such as amperage, temperature, and air pressure, and adjusts knobs to insure conformance with specifications. Removes sprayed workpiece after specified length of time and places it in oven for curing. Adjusts oven timing and temperature controls according to specifications. Measures cured workpiece with gages, calipers, and micrometers to insure that dimensions conform to specifications. Weighs workpiece before and after spraying to ascertain amount of tungsten on workpiece. (3) Cleans plasma arc equipment: Removes spray head from arm, using handtools and cleans orifices with solvent or installs new spray head. Bolts metal shield behind workpiece and fills tub beneath workpiece with water so that tungsten not bonded to workpiece will be collected on shield or in tub to be reclaimed for other purposes. Notifies maintenance personnel of equipment failures. (4) Sprays metal or ceramic material on parts, such as shafts and plates to build up worn spots or to apply protective coatings, using conventional metalizing equipment: Sandblasts workpiece to clean surface preparatory to spraying. Reads work orders describing type of metal in workpiece and thickness of coating to be sprayed. Selects type of metal to spray on workpiece according to knowledge of bonding properties between metals. Positions spool of metal on spindle and threads rod metalizer spray gun. (When spraying ceramic material,

METALIZER, PLASMA ARC (Continued)

zirconium oxide, pours powdered substance into hopper mounted on top of spray gun.) Selects nozzle according to type of material being sprayed and mounts it in gun. Attaches hoses between gun and tanks of oxygen and acetylene. Turns knobs to adjust feed rate and gas pressure. Clamps workpiece to table or mounts it on shaft to rotate part. Turns knob to adjust speed of rotation of workpiece. Ignites gases and pushes button to start flow of powder which is atomized and sprayed onto workpiece. Guides gun along surface of workpiece at specified distance from workpiece and rate of travel, applying knowledge of metalizing process.

D.O.T. Conversion: None 505.782

Starting Hourly Wage Rate For Defense Occupation.....$3.36

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
METAL SPRAYER, PRODUCTION	(any ind.)	505.884	None	INA	INA
SOLDER SPRAYER	(any ind.)	505.884	None		
METAL-SPRAYING-MACHINE OPERATOR CRUCIBLE GUN	(any ind.)	505.782	None		
METAL-SPRAYING-MACHINE OPERATOR, AUTOMATIC I	(any ind.)	505.782	None	INA	INA

Defense Job Title: METAL WORKER, BENCH

Fabricates tubular, bar, or sheet metal missile parts, such as electronic chassis, longerons, stiffeners, brackets, and hemispheres, using metal fabricating machines and handtools: (1) Lays out work: Reviews blueprints to ascertain sequence of operations and the type of sheet metal to be used, applying knowledge of forming characteristics of sheet metal and alloys used. Measures tubular, bar, or sheet stock to locate reference points for deep draws, compound angles, and compound contours, using rule. Marks lines of reference and center points on stock, applying knowledge of geometry and trigonometry, and using layout tools, such as scriber, divider, straightedge, compass, or template. (2) Operates machines to cut, bend, and shapes stock: Positions stock on bed of machine and alines layout marks on stock with die or blade of machine. Pushes button to start sheet metal fabricating machines, such as cut-off saws, and power rolls, brake, and shears to cut, bend, and shape stock. Removes stock from machine, and measures stock to assure conformance to blueprint specifications, using rules, templates, or gage. (3) Fabricates missile parts: Secures metal stock in fixture, using vises, clamps, or wrench. Forms ducts, requiring compound curves, rolls edges to specified diameters, and forms contoured flanges to be used by other workers in repairing damaged areas of production parts, using handtools, such as shears, hammers, and pliers, and such work aids as sandbags, anvils, and form blocks. Removes distortions from warped sheet metal, using pneumatic air hammer and sandbags. Fits and joins missile parts to fabricate complete sheet metal assemblies, using rivet guns and assembly toolings. Slides fingers over parts to detect rough edges and burrs. Removes rough edges, rust and burrs, using files, portable grinder, or wire brush. Measures workpiece to assure conformance to blueprint specifications, using precision measuring instruments, such as micrometers, gages, and calipers. Constructs temporary tooling and templates, using sheet metal forming machines and handtools.

D.O.T. Conversion: SHEET-METAL WORKER (any ind.) 804.281

METAL WORKER, BENCH (Continued)

Starting Hourly Wage Rate For Defense Occupation.....$3.10

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
SHEET-METAL-FABRICATING-MACHINE OPERATOR	(any ind.)	616.380	None		
SHEET-METAL-WORKER (D.O.T. Conversion)					
Coppersmith	(any ind.)	804.281	None		
Fabricator, Special Items	(any ind.)	804.281	None		
Model Maker, Sheet Metal	(any ind.)	804.281	None		
Product-Development Man	(any ind.)	804.281	None		
Roofer, Metal	(any ind.)	804.281	None		
Sheet-Metal Installer	(any ind.)	804.281	None		
Sheet-Metal Worker, Maintenance	(any ind.)	804.281	None		
Shop Mechanic	(any ind.)	804.281	None		
Tinsmith	(any ind.)	804.281	None		
FABRICATOR-ASSEMBLER, METAL PRODUCTS	(any ind.)	809.381	None	Lower	Good

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
SHEET-METAL-LAY-OUT MAN	(any ind.)	809.381	None		
			Over 30 days up to and including 3 months		
MACHINE OPERATOR I	(any ind.)	616.380	Learn techniques of cutting, bending, straightening, and forming metal plates and structural shapes.		
			Over 3 months up to and including 6 months		
LAY-OUT MAN I	(any ind.)	809.381	Learn procedures for laying out reference points on plates, tubes, and structural shapes.		
STRUCTURAL-STEEL LAY-OUT MAN	(any ind.)	809.381	Learn general requirements of structural frameworks, and effect of heat and necessary allowances for thickness of metal to project location of holes, cuts, and bends from blueprint specifications.		

Defense Job Title: MILLING MACHINE OPERATOR "A"

Sets up and operates hand and power fed milling machine to machine ferrous and nonferrous metal missile parts, such as o-rings, brackets, and firing unit housings: (1) Lays out work: Reviews job orders and blueprints to ascertain the part to be milled and sequence of operations. Lays out center points and lines of reference on billets, castings, forgings, extrusions, and plate, bar, and tube stock to be used as guides in machining operations, applying knowledge of shop mathematics and geometry, and using layout tools, such as scriber, divider, and center punch. (2) Sets up machine: Mounts and adjusts machine fixtures, attachments, and accessories, such as rotary table, indexing head, angle vise, vee-blocks, and angle plate. Alines and fastens workpiece on machine bed, using holding fixture and wrenches. Mounts cutting tools, such as milling cutter, drill, reamer, and boring bar, using wrench. Sets feed, speed, and depth of cut, applying knowledge of machinability of metals. Positions tube to direct flow of coolant or cutting oil over workpiece. (3) Operates machine: Starts machine. Turns handle to feed workpiece against cutting tool to mill compound angles, multiple angles, and radii; to drill equally spaced holes; to cut spline and keyway; or to serrate workpiece. Verifies conformance of workpiece to blueprint specifications, using precision measuring instruments, such as micrometers, calipers, rules, dial indicators, adjustable parallels, bevel protractors, gage blocks, and sine plates and bars. Works to tolerance of .005 inches. (4) Grinds tools: Operates bench grinder to sharpen tools and bits.

D.O.T. Conversion: MILLING MACHINE SET-UP OPERATOR (mach. shop) 605.782

MILLING MACHINE OPERATOR "A" (Continued)

Starting Hourly Wage Rate For Defense Occupation.....$3.04

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
STEEL-WOOL-MACHINE OPERATOR, AUTOMATIC	(abrasive & polish. prod.)	605.782	None		
ROUTER OPERATOR	(aircraft mfg.)	605.782	None		
ROUTER OPERATOR, RADIAL	(aircraft mfg.)	605.782	None		
BARREL-RIB MATTER	(firearms)	605.782	Learn honing process to remove burrs from sighting ribs on shot guns.		
BROACHING-MACHINE OPERATOR, PRODUCTION	(mach. shop)	605.782	None		
SCALPER OPERATOR	(nonfer. metal alloys)	605.782	None		
			Anything beyond short demonstration up to and including 30 days		
KEYSEATING-MACHINE SET-UP OPERATOR	(mach. shop)	605.782	Learn keyseating methods and procedures.		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Anything beyond short demonstration up to and including 30 days		
PROFILING-MACHINE SET-UP OPERATOR	(mach. shop)	605.782	Learn methods of working with a duplicating type milling machine.		
SHAPER SET-UP OPERATOR, TOOL	(mach. shop)	605.782	Learn shaping operations.		
THREAD-MILLING-MACHINE SET-UP OPERATOR	(mach. shop)	605.782	Learn thread types and thread milling methods.		
			Over 30 days up to and including 3 months		
BROACHING-MACHINE SET-UP OPERATOR	(mach. shop)	605.782	Learn broaching machine set ups.		
ENGRAVER, TIRE MOLD	(mach. shop)	605.782	Learn machine set ups.		
PANTOGRAPH-MACHINE SET-UP OPERATOR	(mach. shop)	605.782	Learn methods of working with a duplicating type milling machine.		
PLANER SET-UP OPERATOR, TOOL	(mach. shop)	605.782	Learn machine planing procedures.		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 30 days up to and including 3 months		
GRINDER SET-UP OPERATOR, THREAD	(mach. shop)	609.782	Learn thread grinding procedures, wheel dressing operations and tooling.		
MULTI-PURPOSE-MACHINE OPERATOR, TAPE CONTROL	(mach. shop)	609.782	Learn tape control procedures.		
Milwaukee-matic Operator	(mach. shop)	609.782	" "		
TAPE-CONTROL MACHINE OPERATOR	(mach. shop)	609.782	Learn tape control process.		

Defense Job Title: MILLING MACHINE OPERATOR, NUMERICALLY CONTROLLED

Sets up and operates milling machine that automatically machines missile parts, such as rocket stands, clamp rings, and firing unit housings: (1) Sets up machine: Reviews engineering drawings and machine set-up charts to determine fixture to be used and position of workpiece. Bolts fixture to machine bed, using wrench. Positions workpiece on fixture, according to machine set-up charts and applying knowledge of methods used to prevent warpage of workpiece. Loads magnetic or perforated tape into console of machine and hooks tape beginning point over reading mechanism. Determines and adjusts initial cutting tool and control settings and installs cutting tools in machine magazine according

MILLING MACHINE OPERATOR, NUMERICALLY CONTROLLED (Continued)

to job order specification. (2) Operates machine: Starts machine. Turns handle to aline spindle with workpiece, and synchronize it with tape. Directs flow of coolant over workpiece. Turns handle to engage machine in automatic machining cycle. Turns handle to control feed rate override, as necessary, to prevent spindle overload, and to assure desired finish. Scans gages and console for abnormal readings and changes or adjusts cutting tool, fixture, and clamp settings applying knowledge of machine capacities and machinability of metals and using handtools, such as wrenches and pliers. Operates machine manually during periods of unprogrammed tooling as indicated by job order. Measures workpiece to assure conformance with blueprint specifications, using precision measuring instruments, such as micrometers, gages, and calipers.

D.O.T. Conversion: TAPE-CONTROL MACHINE OPERATOR (mach. shop) 609.782

Starting Hourly Wage Rate For Defense Occupation.....$3.04

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Anything beyond short demonstration up to and including 30 days		
AUTOMATIC-WHEEL-LINE OPERATOR	(mach. shop)	609.782	Become familiar with machine operations.		
			Over 30 days up to and including 3 months		
DRILL PRESS OPERATOR, TAPE CONTROL	(mach. shop)	606.782	Become familiar with drill press operations.		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 30 days up to and including 3 months		
JIG-BORER, TAPE CONTROL	(mach. shop)	606.782	Become familiar with jig boring operations.		
MULTI-PURPOSE-MACHINE OPERATOR, TAPE CONTROL	(mach. shop)	609.782	Become familiar with machine operations.		

Defense Job Title: MISSILE ELECTRICAL AND ELECTRONICS DEVELOPMENT MECHANIC

Lays out, installs, and tests missile electrical and electronic systems, such as guidance, control, and power plant on developmental or mockup missiles, to prove engineering design: (1) Plans layout of circuitry: Reads design sketches, loftlines, and blueprints, and confers with professional personnel to determine type of circuitry to be installed. Installs junction boxes in mockup, according to knowledge of circuitry, and using electricians' handtools. Selects type of wire to be used, applying knowledge of factors, such as space, weight, surfaces, and operating temperatures. Plans routing of wire considering factors, such as space, points of strain, reinforcement, insulation requirements. Measures mockup to ascertain variables, such as length of wires to be cut, location of branching cables, and points for brackets or additional insulation. (2) Installs wiring in mockup: Cuts wires to size, according to measurement or dimensions from blueprints, and using electricians' handtools. Installs circuitry in mockup

MISSILE ELECTRICAL AND ELECTRONICS DEVELOPMENT MECHANIC (Continued)

using tape, clamps, screws, soldering iron, and plugs. Ties wires together at various points to form cables and harnesses. (3) Tests continuity, resistance, and high voltage breakdown of circuitry: Performs AC power checkout following specified procedures, and using testing equipment, such as vacuum tube voltmeter and multimeter. Tests continuity and resistance of circuitry, using circuit analyzing equipment (DITMCO). Reads dials or observes lights on testing equipment and compares readings with specifications to ascertain whether electrical system functions as prescribed. (4) Designs formboards from wire mockup installation: Places pegs on pegboard to correspond with color, dimensions, bend, and branches of cables and harnesses. Draws sketches of wiring to be used by production workers who assemble cables and harnesses. (5) Occasionally fabricates wood and metal workaids, such as brackets and braces, using hand and machine tools.

D.O.T. Conversion: ELECTRICAL AND RADIO MOCK-UP MAN (aircraft mfg.) 825.381

Starting Hourly Wage Rate For Defense Occupation.....$3.49

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
AIRCRAFT MECHANIC, ELECTRICAL AND RADIO	(aircraft mfg.)	825.381	None		
ELECTRICAL INSPECTOR	(aircraft mfg.)	825.381	None		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 30 days up to and including 3 months		
ELECTRICIAN, AIRPLANE	(aircraft mfg.)	825.281	Learn to diagnose malfunctions in circuitry.		
ELECTRICIAN, AIRPLANE	(air trans.)	825.381	Learn to diagnose malfunctions in circuitry.		
ELECTRICIAN	(ship & boat bldg. & rep.)	825.381	Become familiar with ship and boat layouts.		
Electrician, Ship	(ship & boat bldg. & rep.)	825.381	" "		
Electrician, Shop	(ship & boat bldg. & rep.)	825.381	" "		
Electrician, Yard	(ship & boat bldg. & rep.)	825.381	" "		

Defense Job Title: MISSILE FABRICATION AND STRUCTURES DEVELOPMENT MECHANIC

Lays out, fabricates, assembles, installs, and checks out structures, structural components, and systems of developmental and mock-up missiles, such as gear housing, bulkheads,

and chassis, to determine the feasibility of engineering design, using metal forming, bending, blanking, and cutting machines and special fitting and assembly tools: (1) Lays out work: Analyzes preliminary engineering design drawings, loft data, sketches, and verbal information to determine sequence of fabrication process, type of stock to be used, and the function of the parts in the missile. Measures lines of reference, coordinating points, and angles onto metal and plastic stock, applying knowledge of geometry and trigonometry, and using precision measuring instruments, such as micrometers and calipers. Marks reference lines on stock, using layout tools, such as scriber and straightedge. (2) Fabricates parts: Sets up sheetmetal fabricating machines, such as power shears, power brake, bending rolls, and drill press by selecting, positioning, and clamping dies, blades, cutters, and fixtures into machine. Positions and clamps machine stops and guides, applying knowledge of machine operation. Operates machine to form, bend, blank, and cut parts, according to engineering specifications. Shapes part to final form, using hammer, anvil, and form. Prepares work order, as necessary, to initiate the machining of metal parts by production personnel or subcontractors. Routes part requiring tests prior to assembly, to test personnel. (3) Assembles and installs parts: Assembles developmental missile parts, such as antennas and gear assemblies, applying knowledge of physical and working characteristics of missile structural materials, and using standard and special metal fitting and assembly tools. Installs parts in missile, following preliminary design information, and using handtools. (4) Checks out installation: Actuates mechanical parts to assure that they function according to specifications and to prevent interference with other systems, structures, and installations. (5) Recommends changes: Suggests design changes, verbally or by sketches, to engineering personnel when part or assembly cannot be made or installed as designed, or does not meet functional requirements. Recommends simplification in procedures for fabrication, assembly, installation, and maintenance of structure or structural components, based on techniques used. (6) Paints parts: Cleans parts with cleaning fluid and sands them to prepare surface for painting. Applies masking tape to areas not requiring paint, and applies paint, using aerosol spray paint can or spray painting equipment. Inscribes numerals on designs on part, using stencils or decals.

D.O.T. Conversion: SHEET-METAL WORKER (any ind.) 804.281

MISSILE FABRICATION AND STRUCTURES DEVELOPMENT MECHANIC (Continued)

Starting Hourly Wage Rate For Defense Occupation.....$3.49

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
SHEET METAL WORKER (D.O.T. Conversion)					
Coppersmith	(any ind.)	804.281	None		
Fabricator, Special Items	(any ind.)	804.281	None		
Model Maker, Sheet Metal	(any ind.)	804.281	None		
Product-Development Man	(any ind.)	804.281	None		
Roofer, Metal	(any ind.)	804.281	None		
Sheet-Metal Installer	(any ind.)	804.281	None		
Sheet-Metal Worker, Maintenance	(any ind.)	804.281	None		
Shop Mechanic	(any ind.)	804.281	None		
Tinsmith	(any ind.)	804.281	None		
SHEET-METAL-LAY-OUT MAN	(any ind.)	809.381	Learn layout procedures for specific product.		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Anything beyond short demonstration up to and including 30 days		
FABRICATOR-ASSEMBLER, METAL PRODUCTS	(any ind.)	809.381	Learn metal products production operations. One responding employer suggests vocational school training course of unspecified duration.	Lower	Good
			Over 30 days up to and including 3 months		
MACHINE, OPERATOR I	(any ind.)	616.380	Learn sheet metal production operations.		
SHEET-METAL-FABRICATING-MACHINE OPERATOR	(any ind.)	616.380	Learn sheet metal production operations.		
			Over 3 months up to and including 6 months		
LAY-OUT MAN I	(any ind.)	809.381	Develop layout skills.		
STRUCTURAL-STEEL LAY-OUT MAN	(any ind.)	809.381	Develop layout skills.		

Defense Job Title: MISSILE FLUID SYSTEMS DEVELOPMENT AND TEST MECHANIC

Develops, assembles, installs, modifies, and tests new and modified missile fluid systems and assemblies to test or prove engineering design, according to design drawings, loft data, sketches, and oral engineering information: (1) Lays out work: Analyzes engineering design information, loft data, sketches, and verbal engineering information to determine sequence of operations. Locates, measures, and marks coordinating points and reference lines on fluid system parts, using layout tools, such as scriber, straightedge, compass, and protractor. (2) Fabricates parts: Sets up and operates machines, such as engine lathe, mill, brake, rolls, tube bending machine, arbor press, saws, and crimper to fabricate parts, such as brackets, stiffeners, patches, and shims, applying knowledge of machine operations. Improvises shop aids, tools, and handling equipment to facilitate fabrication, installation, and assembly of parts. (3) Assembles and installs parts: Assembles and installs components of missile fluid systems, parts, and assemblies, using mechanics' handtools. Inspects assemblies to assure conformance to specifications, using precision measuring instruments, such as micrometers, depth gages, thread gages, and calipers. Confers with company liaison and engineering personnel and suggests design changes in missile fluid systems, parts, and structures when they do not meet functional demands, cannot be made or installed as designed, or where change will simplify fabrication, assembly, installation, or maintenance of system, applying knowledge of feasibility of design. Prepares sketches to illustrate suggested design changes. Disassembles, reworks, and modifies fluid systems assemblies and parts to correct any malfunctions in missile fluid systems. (4) Tests fluid systems: Confers with engineering personnel to develop and prepares test set-ups. Sets up fluid system test equipment, such as oscilloscopes, hydraulic test bench, electronic console, electric meters, and graphic recorders by calibrating flow meters, and connecting valves, pressure gages, and flow indicators to fluid system. Fills reservoirs with missile fluids, chemicals, or propellents. Operates test equipment that simulates flight test to prove engineering design. Records instrument readings, such as mechanical tolerances, rate of flow, and pressure tolerances for analysis by engineering personnel. Disconnects test equipment at completion of test.

D.O.T. Conversion: AIRCRAFT MECHANIC, PLUMBING AND HYDRAULICS (aircraft mfg.) 862.381

MISSILE FLUID SYSTEMS DEVELOPMENT AND TEST MECHANIC (Continued)

Starting Hourly Wage Rate ForDefense Occupation.....$3.49

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 30 days up to and including 3 months		
PIPE FITTER I	(const.)	862.381	Learn welding operations and and installation techniques for such equipment as compressors, pumps, meters and controls.		
PIPE FITTER, DIESEL ENGINE	(engine & turbine)	862.381	Learn brazing operations.		
PIPE FITTER, TURBINE	(engine & turbine)	862.381	Learn brazing, tack welding, and heating operations.		

Defense Job Title: MOCKUP AND TOOLING MECHANIC

Lays out, fabricates, and assembles plaster and plastic jigs and fixtures, reduced scale experimental mockups, complete and cutaway models, and plaster patterns of missile

MOCKUP AND TOOLING MECHANIC (Continued)

prototypes, parts, assemblies, systems, and internal equipment: (1) Lays out work: Reviews incomplete engineering information, detail and assembly blueprints, loft data, rough sketches, shop orders, and verbal and written information to determine methods required and sequence of operations necessary to fabricate master tooling models and plaster patterns. Computes dimensions omitted by design data, applying knowledge of shop mathematics and trigonometry. Marks reference points and lines on plastic stock, applying knowledge of layout procedure and using layout tools, such as scriber, straightedge, dividers, and center punch. (2) Fabricates parts: Sets up and operates wood planers, wood lathes, routers, joiners, drill presses, band and table saws, and disk and spindle sanders to shape sheet plastic contours of such missile parts as skins, ribs, and nose cone and to construct wooden frames and bases. Drills, countersinks, and reams holes using wrench. Pours plaster between contours and smoothes it applying knowledge of plaster shrinkage and using straightedge. Manually applies plaster to depressed areas caused by shrinkage. Sands hardened plaster, using sandpaper or machine sander. Fabricates form blocks, and templates, using such machines as engine lathe, milling machine, riveting equipment, and portable power tools. Builds up impregnated fiberglass laminates on forms to fabricate plastic parts. Smoothes lamination to remove wrinkles and air bubbles, using sponge roller. Places lamination in oven. Adjusts oven thermostat to regulate temperature for specific curing time. Sands cured laminations to desired finish by hand or machine. Drills, countersinks, and reams holes in parts and assemblies for bolts and screws, using portable drill. Suggests changes in design to company liaison personnel, applying knowledge of feasibility of design and obtains approval to incorporate changes in prototype or model. Prepares sketches to indicate changes in parts. Prepares work order to obtain machine parts. (3) Assembles parts: Assembles plastic, wooden, and metal parts using handtools, such as screwdriver, wrenches, and pliers. Measures dimensions of assembled parts to assure conformance to blueprint specifications, using precision measuring instruments, such as micrometers, gages, and calipers. Works to tolerances of $\pm$ .0001 in. Applies paint to mockup with aerosol spray can, air brush, or compressed air spray equipment in spray booth.

D.O.T. Conversion: None 693.281

MOCKUP AND TOOLING MECHANIC (Continued)

Starting Hourly Wage Rate For Defense Occupation.....$3.49

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
MOCKUP MAN	(aircraft mfg.)	693.381	None		
			Over 30 days up to and including 3 months		
DEVELOPER PROVER MECHANICAL	(aircraft mfg.)	693.280	Become familiar with aircraft equipment.		
EXPERIMENTAL-AIRCRAFT MECHANIC	(aircraft mfg.)	693.280	Become familiar with experimental aircraft parts fabrication.		
FORM BUILDER	(aircraft mfg.)	693.280	Become familiar with aircraft parts production.		
Wood Tool Maker	(aircraft mfg.)	693.280	" "		
EXPERIMENTAL MECHANIC I	(aircraft mfg.)	693.281	Learn construction of parts for testing.		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 30 days up to and including 3 months		
ROCKET-ENGINE MECHANIC	(aircraft mfg.)	693.281	Become familiar with rocket engines.		
Rocket Engine Mechanic, Liquid	(aircraft mfg.)	693.281	" "		
Rocket Engine Mechanic, Solid	(aircraft mfg.)	693.281	" "		
LOFTSMAN	(aircraft mfg.)	693.381	Become familiar with aircraft layout processes.		
MODEL MAKER I	(aircraft mfg.)	693.381	Become familiar with scale model making procedures.		
Model Maker Rocket	(aircraft mfg.)	693.381	" "		
			Over 3 months up to and including 6 months		
SAMPLE-BODY BUILDER	(auto mfg.)	693.380	Learn automobile design principles.		

Defense Job Title: MODEL MAKER, EXPERIMENTAL

Constructs static and operational models of rockets and rocket propulsion systems, using woodworking and metalworking machines: (1) Plans sequence of operations: Reads plans submitted by professional workers or confers with engineering personnel to obtain specifications necessary to draw sketches of product to be fabricated. Selects construction materials, such as wood, metal, and plastic, according to factors, such as strength, stress, and cost, based on job knowledge. Selects machinery to be used and sequence of fabrication according to material of workpiece and knowledge of model making techniques. (2) Lays out dimensions on wood, metal, and plastic stock: Lays out part according to designated scale, using work aids, such as protractors, rules, squares, crayons, and scribers. Computes dimensions and angles not called out in specifications using knowledge of trigonometry. Cuts stock to size or saws contours of product, using machinery, such as bandsaws, cut-off saws and table saws. (3) Sets up and operates woodworking equipment to fabricate wooden portions of model: Selects cutting tool for machinery, such as wood lathe, shaper, or router according to type of cut to be made. Mounts cutting tools in tool post or spindle, using wrenches. Adjusts parts of machinery such as stops, guides for workpiece, and tool rests, according to knowledge of individual machine set ups and product dimensions. Secures workpiece in chuck or on faceplate, or positions workpiece on machine bed, using guide bars and templates. Starts machine and feeds cutting tool against part or guides workpiece under cutting tools to perform operations, such as turning, slotting, or grooving. Smooths workpiece, using hand and machine tools, such as planers and sanders. Drills holes, using power driven handtools. Measures dimensions and angles of part to verify conformance with specifications, using instruments, such as gages and calipers. (4) Sets up and operates metal working machinery to fabricate parts from metal and plastic: Selects cutting tool for machinery, such as engine lathe and milling machine according to such factors as material to be machined, size of cut, and machine characteristics. Mounts tool on toolpost or in spindle. Positions,and secures part to machine bed with bolts. Adjusts controls to regulate variables, such as depth of cut and rate of travel, according to knowledge of machine characteristics. Verifies accuracy of set up, using devices, such as height gages and surface gages. Turns handwheel to bring cutting tool in contact with workpiece and engages automatic feed. Drills holes in parts, using drill press. Smooths rough edges, using pedestal grinder. Heats parts, using oxyacetylene torch and observes color of part to determine when part has reached specified temperature. Quenches parts in vats filled with oil or water. Finishes parts to specified tolerance, using handtools. Verifies accuracy of

MODEL MAKER, EXPERIMENTAL (Continued)

dimensions using micrometers, limit gages, Jo blocks, and optical flats. (5) Sets up and operates metal forming equipment to fabricate full scale models from sheet metal: Selects sheet metal according to knowledge of metal properties and configuration of product to be fabricated. Clamps dies and cutters into equipment, such as power brake and shears, according to type of cut, perforation, or bend desired. Turns handwheels to adjust pressure, depth of ram stroke, and speed of machine. Alines dimensional layout lines with dies, using crane to move and position workpiece. Starts machine that lowers ram to cut or shape part. Modifies shape of part, using sheet metal hammer and block. Verifies accuracy of dimensions with measuring instruments. (6) Assembles parts of models, using handtools. Finishes part, using hand and power driven finishing tools. Installs hardware, such as hinges and brackets, using screwdrivers. Bolts metal parts together, using wrenches. Glues parts made from synthetic materials to form assemblies. Installs electrical wiring and components for remote control of pumps, valves, and motors, according to knowledge of electrical circuitry. Solders wiring to terminal, using soldering iron and silver solder. Welds metal parts together, using oxyacetylene welding equipment. (7) Paints model: Draws detail on model to depict insignia or functional systems, following specifications or applying job knowledge. Mixes pigment and solvent to match sample color submitted by engineering personnel. Applies paint to model, using brush or spray gun. Paints detail on model, using air brush (miniature spray painting device). Fashions likeness of human figures from clay, using sculpting tools. (8) Installs special devices in rocket related to testing of aerodynamic properties: Bends sheet metal tubing according to specifications, using tube bending equipment. Brazes tubing, used in measurement of air flow and pressure, beneath skin of model, with brazing equipment. Solders metal rakes (air flow diversion devices) in specified locations, using soldering iron and silver solder. (9) Performs related duties: Fabricates tool, jigs, chucks and templates, used in the construction of models, from available materials. Performs external modifications on machinery, such as extending beds and inserting risers to adapt machinery to projects.

D.O.T. Conversion: MODEL MAKER, ROCKET (aircraft mfg.) 693.381

MODEL MAKER, EXPERIMENTAL (Continued)

Starting Hourly Wage Rate For Defense Occupation.....$3.71

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
MACHINIST I	(mach. shop)	600.280	None		
DEVELOPER PROVER, MECHANICAL	(aircraft mfg.)	693.280	None		
EXPERIMENTAL AIRCRAFT MECHANIC	(aircraft mfg.)	693.280	None	Lower	INA
MOCK-UP MAN	(aircraft mfg.)	693.381	None	Lower	INA
			Anything beyond short demonstration up to and including 30 days		
MODEL MAKER	(firearms)	600.280	Become oriented to fire-arms.		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 30 days up to and including 3 months		
PATTERNMAKER, METAL	(found.)	600.280	Learn layout of foundry patterns, core boxes, and match plates.		
CABINET MAKER	(wood-working)	660.280	Learn additional woodworking skills. One responding employer indicates necessity for a company sponsored training course 30 to 90 days in duration.	Lower	Good
MODEL MAKER, WOOD	(any ind.)	661.380	Become familiar with specific product.	Lower	Indeterminate
LOFTSMAN	(aircraft mfg.)	693.381	Become familiar with aircraft design. Learn to make preliminary layouts in reduced scale.	INA	INA

Defense Job Title: MOLDER, PROTECTIVE COMPOUNDS, SENIOR

Applies protective resinous plastics to modules used in electrical and electronic circuits of missile systems, according to blueprint and process specifications, and using handtools: (1) Reviews blueprints: Reviews blueprints and process specifications to ascertain molding methods and sequence of operations. (2) Coats modules: Applies cleaning solvent to module and mold to remove dust and dirt, using brush. Masks portions of modules not to be covered with protective compound, using masking tape. Attaches holding devices to module in order to prevent module from moving. Mixes ingredients of resinous compounds applying knowledge of process and formula specifications, and physical properties of plastics, and using mixing container and ladle. Brushes or sprays protective compounds on module, using brush or spray equipment. (3) Cures and finishes modules: Positions coated module in oven or under lights for specified period of time to cure protective compound. Removes excess plastic from cured module, using handtools, such as files, knives, scrapers, and sandpaper. Measures module to assure conformance to blueprint specifications, using micrometers. (4) Occasionally molds units, components, and parts by placing them in molds and pouring specified compound into or over unit and curing compound in oven.

1978

D.O.T. Conversion: ENCAPSULATOR (aircraft mfg.) 556.884

MOLDER, PROTECTIVE COMPOUNDS, SENIOR (Continued)

Starting Hourly Wage Rate For Defense Occupation.....$2.71

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Anything beyond short demonstration up to and including 30 days		
ISOFORM MIXER	(aircraft mfg.)	559.884	Learn use of electric ovens and propeller molding machines.		
RUBBER MOLDER	(model & patterns)	556.884	Learn form stripping and rubber setting properties.		
MOLD-FILLING OPERATOR	(plastics mat.)	556.884	Learn optimum flow rate of solution and to adjust angle of cell to avoid formation of air bubbles.		
SCAGLIOLA MECHANIC	(stat. & art goods)	556.884	Learn finishing techniques for scagliola.		

Defense Job Title: MOLDER, SENIOR

Forms sand molds and lacy cores and casts metal parts for rocket propulsion systems, using foundry equipment and handtools: (1) Forms sand molds: When forming drag molds, positions drag (lower portion of flask) and pattern on table rollover machine. Selects Chills to control cooling and shrinkage of metal, according to configuration of part and type of material being cast. Brushes liquid refractory onto chills and positions them adjacent to pattern, according to knowledge of molding and casting process. Shakes premixed sand through riddle to insure that texture of sand covering pattern is even. Shovels specially prepared sand into flask. Pushes lever with knee to activate jolting mechanism on rollover machine or used hand or pneumatic rammers to ram sand in flask. Scrapes excess sand from top rim of flask to level sand, using piece of board. Positions board on flask and clamps board and flask to machine table. Pushes levers in sequence to activate machine that lifts and inverts flask, vibrates flask to loosen sand from pattern, and removes pattern from drag. Loosens bolts on flask with wrenches and removes flask from mold. When forming cope molds, positions cope (top of flask) and pattern on table of pin-lift machine. Shovels sand into flask. Positions chills, sprue pins, and Riser Pins in flask according to knowledge of foundry processes. Rams sand in flask by jolting mechanism of pin-lift machine, or using hand or pneumatic rammers. Turns lever to start pin-lift machine that lifts pattern from mold. Removes flask from mold, using wrench. (When forming molds small enough to be handled manually, places flask and pattern plates on jolt-squeeze machine that rams sand in flask by combination of jolting and squeezing sand against pattern by means of squeeze plates powered by air pressure.) Blows sand from completed mold, using air gun. Removes sprue and riser pins and cuts gate in mold using gate cutter. Repairs crumbled parts, using finishing tools, such as trowels, slicks, and spoons. (2) Forms dry sand cores using rollover machine: Clamps core box over pattern on table of machine and fills box with sand, using hands and shovel. Depresses pedal to activate jolting action of machine to shake and compress sand in box. Rams additional sand in box using hand or pneumatic rammer. Removes excess sand from top of core box using piece of board and clamps metal plate to top of box. Pulls lever to activate machine that lifts and inverts corebox and vibrates to loosen sand from pattern and remove pattern from corebox. Repairs crumbled parts of drawn core using finishing tools. Carries core to curing oven on metal plate. Places core in oven. Turns thermostat to obtain desired temperature. Periodically observes color of cores and removes cores when baked according to knowledge of materials and curing procedure. Pastes halves of core together. Brushes liquid refractory on core to protect

MOLDER, SENIOR (Continued)

and strengthen it during casting process. (3) Forms cores using shell core machine: Bolts specified metal patterns to machine, using wrenches. Hand-fills cavity in pattern with core sand. Starts machine that heats pattern causing sand grains to bond together forming configuration of pattern. Removes core after bonding has occurred according to knowledge of shell-core process. Brushes completed core with liquid refractory. (4) Sandcasts metal objects: Positions core inside mold by hand or using overhead hoist and assembles mold, according to specifications. Bolts metal jacket around sides of mold to support walls during casting process. Places metal weights on top of mold to prevent separation of halves by hydraulic action of molten metal. Positions pouring spouts on gates. Tilts crucible containing molten metal to pour metal into ladle. Carries ladle assisted by another worker, or attaches ladle to overhead hoist and moves it to mold. Pours metal through gates, according to knowledge of casting procedures. (5) Tests strength of sand using deadweight compression testing device: Positions sample of rammed sand between compression heads attached to free swinging pusher arm and pendulum. Starts motor that pushes arm along track to move sample in 90 degree arc. Observes specimen to ascertain at what point pressure from pendulum crushes arc. Reads pointer on scale indicating maximum strength of sand in terms of pounds of pressure per square inch. Records results on log. (6) Measures moisture content of sand: Weighs rammed sample of sand on gram scale. Positions sample in moisture teller (oven). Turns controls to adjust temperature and timer according to weight of sample. Starts oven that blows air on sample to evaporate moisture. Weighs sample after drying process. Subtracts weight difference and compares figure with data on chart to ascertain percentage moisture content. (7) Measures permeability of sand using permeability meter: Rams specific quantity of sand in container using hand rammer. Positions container over pressure tube in mercury bath. Fills pressure chamber by opening air valve and lifting bell. Turns handle to open valve allowing air in chamber to escape through sand sample. Sets timer to time escape of air. Reads manometer indicating air pressure and timer and compares readings with data on chart to obtain figure for permeability. (8) Performs related duties: Forms pouring spouts from dry sand using standard patterns and similar techniques used in coremaking. Bakes spouts in oven. Applies liquid refractory to spouts with brush. (9) Occasionally measures configuration of molds and cores with vernier calipers.

D.O.T. Conversion: MOLDER, BENCH (found.) 518.381

MOLDER, SENIOR (Continued)

Starting Hourly Wage Rate For Defense Occupation.....$3.48

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
COREMAKER	(found.)	518.381	None		
MACHINE MOLDER	(found.)	518.782	None		
Machine Molder, Rollover	(found.)	518.782	None		
Machine Molder, Squeeze	(found.)	518.782	None		
Molder Fitting	(found.)	518.782	None		
			Over 30 days up to and including 3 months		
MOLDER, SWEEP	(found.)	518.381	Learn sweep techniques for using floor molds.		
			Over 3 months up to and including 6 months		
MOLDER, BENCH	(jewelery)	518.381	Learn bench molding techniques.		

Defense Job Title: PAINTER

Applies prime or protective coat of paint, such as enamel and lacquer, on interior surfaces and structures of missiles, using spray gun: (1) Prepares equipment for painting: Mixes specified proportions of pigment, solvent and paint to obtain specified color and viscosity, using mechanical paint mixer. Pours paint into receptacle on spray gun. Reads air pressure indicator and opens valve to regulate air pressure, as specified. Starts spray equipment and turns nozzle to adjust size and width of spray according to desired spray pattern. (2) Paints missile parts: Sprays sample object with paint and readjusts nozzle to obtain desired spray pattern. Applies prime coat to missile parts by manually turning turntable and guiding spray gun over surface of part, applying knowledge of spray painting to maintain distance and speed of travel. Places racks of designated parts under infra-red lights for baking. Turns knob to adjust amperage for infra-red equipment. Starts equipment to bake parts for specified length of time. (3) Applies identification decals to surface of parts: Reads work order to ascertain where decal will be applied. Locates position on missile part for placement of decal, using ruler. Applies decal to part, using damp rag. (4) Cleans nozzles and hoses off spray apparatus with solvent. Scrapes paint from turntable, using scraper. Washes paint from spray booth.

D.O.T. Conversion: PAINTER, SPRAY (any ind.) I 741.884

Starting Hourly Wage Rate For Defense Occupation.....$2.85

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
PAINTER, SPRAY I	(D.O.T. Conversion)				
Artificial Limb Sprayer	(surgical appl.)	741.884	None		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
Hat Sprayer	(hat & cap)	741.884	None		
Painter, Ordnance	(firearms)	741.884	None		
Sprayer, Railroad Car	(loco. & car bldg. & rep.; r.r. trans.)	741.884	None		
Laquer Sprayer	(any ind.)	741.884	None		
Porcelain Enamel Sprayer	(any ind.)	741.884	None		
Primer, Sprayer	(aircraft mfg.; air trans.)	741.884	None		
Sprayer, Auto Parts	(auto. mfg.)	741.884	None		
Thinner Sprayer	(auto. mfg.)	741.884	None		
Undercoat Sprayer	(auto mfg.; auto ser.)	741.884	None		

Defense Job Title: PAINTER, MISSILE

Paints missile chamber using spray apparatus: (1) Applies premixed primer, lacquer, and enamel: Positions chambers on conveyor that simultaneously advances chamber along production line and rotates chamber to facilitate painting of surfaces. Turns knobs to regulate speed of conveyor and speed of rotation of chambers according to coat of paint applied, such as primer or finish. Connects hose and nozzle between compressor and spray gun, using wrenches. Applies masking tape over portions of chamber to be left unpainted. Starts compressor and turns nozzle to regulate width and fineness of spray. Applies primer, finish, and flight coats to rotating parts. Smooths rough spots with sandpaper. Cleans nozzle and hose with solvent. (2) Applies decals: Reads work order to ascertain type and location of decal to be applied to chamber. Measures surface of chamber, using straightedge, and marks reference points, following work order dimensions. Brushes adhesive on decal and positions it on chamber.

D.O.T. Conversion: None 845.781

Starting Hourly Wage Rate For Defense Occupation.....$3.12

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
PAINTER, SPRAY I	(any ind.)	741.884	Learn methods of cleaning objects to be painted using soaps or solvents. Learn methods of smoothing and filling surface irregularities.	No Significant Difference	Good

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
STENCILER	(carpet & rug; fiber fugs)	741.884	None		
PAINTER, MIRROR	(mirror)	741.884	None		
PAINTER, WHITE-WALL TIRE	(rubber tire & tube)	741.884	None		
			Anything beyond short demonstration up to and including 30 days		
RAILROAD CAR LETTERER	(r.r. trans)	845.381	Learn to mix paints following color charts, use blowtorch, and cut stencils.	Lower	Poor
PAINTER, AIRCRAFT	(aircraft mfg.; air trans.)	845.781	Learn use of acid solution to roughen parts, use stencils, paint lines and controls.	Higher	Good
PAINTER, AUTOMOBILE	(auto ser.)	845.781	Learn to mix paints and develop color acuity. Some responding employers indicate a preference for either a company sponsored training course of unspecified	Lower	Poor

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Anything beyond short demonstration up to and including 30 days		
PAINTER, AUTOMOBILE (Continued)	(auto. ser.)	845.781	duration or a vocational training course of up to 6 months duration.		
Painter, Automobile, Brush	(auto. ser.)	845.781	" "		

Defense Job Title: PAINTER SPECIAL

Applies protective and finish coats of paint on missiles and to missile parts and assemblies where exacting tolerances are required, using spray equipment: (1) Prepares parts and equipment for spraying: Reads work orders describing type, color, and thickness of paint to be applied, and sections or components to be painted. Mixes pigment and solvent by hand to obtain desired texture or blends pre-mixed paint, using mechanical mixer. Matches colors, applying knowledge of color and properties of paint, and using color charts. Pours paint into vessel on spray apparatus. Reads dial indicating air pressure and opens or closes valve to regulate air pressure, according to specifications. Turns nozzle to adjust size and width of spray. Measures dimensions of parts with ruler and applies masking tape to prescribed areas. (2) Paints missiles, parts, and assemblies using spray apparatus: Starts equipment and guides nozzle over surface of missile or part to apply protective finishes to parts, utilizing knowledge of position, distance, and

PAINTER SPECIAL (Continued)

speed of travel necessary to obtain desired thickness and finish of paint. Examines painted surfaces for imperfections such as drips, runs, or blisters. Sands finish to remove flaws. Measures thickness and emissivity (light reflection of paint), using specially designed gages.

D.O.T. Conversion: PAINTER, AIRCRAFT (aircraft mfg.; air trans.) 845.781

Starting Hourly Wage Rate For Defense Occupation.....$3.20

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
PAINTER, AUTOMOBILE	(auto. ser.)	845.781	None		
			Anything beyond short demonstration up to and including 30 days		
RAILROAD-CAR LETTERER	(r.r. trans.)	845.381	Learn to mix paint following color charts, use blowtorch to remove old paint, and cut stencil.		

Defense Job Title: PILOT PLANT TECHNICIAN

Sets up and operates small-scale chemical production equipment to test fuels and materials to be used in missiles: (1) Installs and operates testing equipment: Assembles chemical processing equipment, such as autoclaves, high pressure compressors, pumps, centrifuges, crystallizers, distillation columns, and filters, according to manufacturer's instructions, using handtools. Installs piping or tubing to route chemicals through processing units. Mixes chemical solution to be tested, according to instructions. Starts equipment and turns valve controls to regulate temperature, pressure, and flow of materials through units. Reads data on dial indicators and records readings in log book. (2) Conducts standard tests to compile research data: Performs quantitative and qualitative chemical analysis, such as titration, fractionation, filtration, and screening, to analyze chemical reactions, following prescribed procedures. Observes chemicals for factors, such as changes in color or precipitation and records data on forms to be analyzed by superiors.

D.O.T. Conversion: PILOT CONTROL OPERATOR (chem.; plastics mat.) 559.782

Starting Hourly Wage Rate For Defense Occupation.....$3.55

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
CHEMICAL OPERATOR III	(chem.)	559.782	None		
CHEMICAL PLANT OPERATOR	(chem.)	559.782	None		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			<u>Anything beyond short demonstration up to and including 30 days</u>		
SPECIALTIES OPERATOR	(chem.)	559.782	Learn to control chemical processing equipment, such as pumps and agitators to prepare small-lot orders or orders requiring unusually rigid process specifications.		
UTILITY OPERATOR	(chem.)	559.782	Learn to operate all types of stills, compressors, reactors, and related chemical process equipment.		
LANOLIN-PLANT OPERATOR	(drug prep. & rel. prod.)	559.782	Learn to control neutralizers, alcohol recovery stills, vacuum drum dryers, and filter presses.		
			<u>Over 30 days up to and including 3 months</u>		
ACID-PLANT OPERATOR	(chem.)	559.782	Learn operation of steam generating equipment and air compressor.		
ALKYLATION OPERATOR	(chem.; petrol. refin.)	559.782	Learn to operate semiautomatic alkylation unit.		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 30 days up to and including 3 months		
CALCINER OPERATOR I	(chem.)	559.782	Learn to control spray dryer, calciners, coolers, and auxiliary equipment.		
CRESYLATE OPERATOR II	(chem.)	559.782	Learn to operate continuous-flow treating and distillation equipment.		
ISOBUTYLENE-EXTRACTION OPERATOR	(chem.)	559.782	Learn to control reactors, regenerators, scrubber towers, heat exchangers, vent drums, barometric condensers, and pumps.		
MAKE-UP MAN	(chem.)	559.782	Learn to control heaters and agitators to prepare chemical constituents of synthetic rubber.		
MVA-REACTOR, OPERATOR, HEAD	(chem.)	559.782	Learn to control catalytic reactors and auxiliary equipment.		
OPERATOR, GAS ODORANTS	(chem.)	559.782	Learn to control cracking furnace, reaction tower, and continuous stills.		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 30 days up to and including 3 months.		
SULFIDE OPERATOR	(chem.)	559.782	Learn to control semiautomatic equipment, such as catalytic reactors, stripping columns, and compressors.		
WASTE-TREATMENT OPERATOR	(chem.)	559.782	Learn to control heat exchange unit, pumps, compressors and related equipment.		
POLYMER OPERATOR	(synthetic fibres)	559.782	Learn to control high pressure reaction kettles.		
SULFONATOR	(tan. mat. & rel. prod.)	559.782	Learn to control heated agitator vats, pumps, and auxiliary equipment.		
			Over 3 months up to and including 6 months		
ALUM-PLANT OPERATOR	(chem.)	559.782	Learn to operate crusher, mill, and conveyor. Learn to regulate flow of materials into equipment.		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 3 months up to and including 6 months		
CATALYST OPERATOR, GASOLINE	(chem.; petrol. refin.)	559.782	Learn how to operate machines to combine ingredients to make catalysts. Learn to regulate flow of materials according to conditions, such as temperature and moisture content		
ACID MAKER	(paper & pulp)	559.782	Learn how to operate sulphur furnaces and to adjust settings to insure conformance to standards.		

Defense Job Title: PLASTIC PARTS FABRICATOR

Builds up layers of fiber-glass cloth on formsand cures them in ovens to fabricate missile parts, such as nose cones, battery boxes, and ray domes, applying knowledge of plastic laminating and curing processes: (1) Lays out cloth: Reviews detail and assembly blueprints and job orders to ascertain the type and amount of fiber-glass to be used and the use of the part to be fabricated. Measures and marks lines of reference on cloth, using rule and marking pencil, and applying knowledge of shop mathematics. Cuts cloth along marked lines, using shears, scissors, or knife. (2) Prepares form: Cleans form, using carbon tetrachloride. Sprays or brushes parting compound, such as wax, or soap film, over form to prevent glass cloth from sticking to form. (3) Builds up laminations: Impregnates glass cloth by dipping it in plastic solution or by feeding cloth through rollers of impregnating machine. Places successive layers of impregnated

PLASTIC PARTS FABRICATOR (Continued)

Cloth over form. Presses cloth to fit contours of form. Smoothes and stretches cloth to remove air pockets, to secure a build-up free of wrinkles and to assure adherence to form. Locates starved areas and applies plastic foam from tube. Cuts away excess cloth, using shears or scissors. (4) Operates vacuum sealing machine: Cuts heavy duty flexible plastic into pieces to conform to general dimensions of laminate, using scissors or knife. Seals edges of plastic pieces to form vacuum bag and installs air hose, using heat sealing equipment. Covers coated form with plastic bag. Connects air hose to valve on vacuum pump. Starts vacuum pump to collapse bag and to draw it tightly over cloth forming solid lamination. Disconnects air hose and places lamination in oven or autoclave. (5) Cures lamination: Places lamination in oven, manually or using floor hoist. Sets controls of oven to regulate temperature, pressure, and curing time, according to specifications. Removes cured lamination from oven after specified curing time. Cuts plastic bag from lamination, using shears, knives, or scissors, and pries lamination from form, using screwdriver. (6) Finishes laminated parts: Trims excess plastic from part, using scissors, files, and knives, and such machines as bandsaw and circle saw. Marks position of holes on part, according to blueprint specifications and using scriber. Drills holes in part, using drill press. Measures part to assure conformance to blueprint specifications, using measuring instruments, such as scales, dial indicators, calipers, and templates. Routes part to sandblasting shop. Sands, peels, files, fills, and patches part to correct defects caused by hardening process.

D.O.T. Conversion: PLASTICS FABRICATOR (aircraft mfg.) 754.884

PLASTIC PARTS FABRICATOR (Continued)

Starting Hourly Wage Rate For Defense Occupation.....$2.92

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Anything beyond short demonstration up to and including 30 days		
CASTER	(fabric. plastics prod.)	754.884	Become familiar with casting operations.		
			Over 30 days up to and including 3 months		
ASSEMBLER-AND-GLUER, LAMINATED PLASTICS	(fabric. plastics prod.)	754.884	Learn soldering and assembly operations.		
FINISHER, HAND	(fabric. plastics prod.)	754.884	Learn engine lathe operation.		
LAMINATOR, PREFORMS	(fabric. plastics prod.)	754.884	Become familiar with plastic products fabrication.		
PLASTIC LAY-UP MAN	(mach. tool & access.)	754.884	Become familiar with machine tool pattern and model casting.		
MOLD LAMINATOR	(ship & boat bldg. & rep.)	754.884	Become familiar with boat manufacturing processes.		

Defense Job Title: PLASTICS FABRICATOR, DEVELOPMENTAL

Fabricates prototype plastic missile parts and assemblies, such as bulkheads, skids, battery boxes, and nose cones, by building up layers of fibre-glass cloth, applying knowledge of plastic laminating, curing, and molding processes: (1) Plans work: Reviews blueprints, sketches, and incomplete loft data to determine materials to be used and function of completed part. Determines method of laying impregnates to build up laminations, dimensions and construction of vacuum bags, temperature time cycles, pressures, and time tolerances, applying knowledge of plastics theory and work experience. (2) Lays out cloth: Lays out plastic parts, following developmental layout procedures. Marks lines of reference, coordinating points, and center points, applying knowledge of algebra and geometry, and using layout tools. (3) Builds up laminations: Cleans form, using carbon tetrachloride. Sprays or brushes parting compound, such as wax or soap film over form to prevent glass cloth from sticking to form. Impregnates glass cloth by dipping it in plastic solution or feeding cloth through rollers of impregnating machine. Places successive layers of impregnated cloth o ver form, applying knowledge of the most effective fabrication methods. Presses cloth to fit contours of form. Smoothes and stretches cloth to remove air pockets and to remove wrinkles. Locates starved areas and applies plastic form from tube. Cuts away excess cloth, using scissors or shears. (4) Fabricates solid lamination using scissors or knife. Seals edges of plastic pieces to form vacuum bag and installs air hose, using heat sealing equipment. Covers coated form with plastic bag. Connects air hose to valve on vacuum pump and adjusts vacuum pressure, utilizing knowledge of pressures required to obtain specified bonding. Starts vacuum pump to collapse bag, drawing it tightly over cloth to form solid lamination. (5) Cures lamination: Places lamination in oven, manually or using floor hoist. Sets controls of oven to regulate temperature, pressure, and curing time, according to job knowledge of optimum curing conditions. Removes cured lamination from oven. Cuts vacuum bag from lamination, using shears, knives, or scissors, and pries lamination from form, using screwdriver. (6) Finishes laminated part: Trims excess plastic from part, using scissors, files, and knives, and such machines as bandsaw and circle saw. Marks position of holes on part, according to blueprint specifications and using scriber. Drills holes in part, using drill press. Measures part to assure conformance to blueprint specifications, using measuring instruments, such as scales, dial indicators, calipers, and templates. Routes part to sandblasting shop. Sands, peels, files, fills, and patches part to correct defects caused by hardening process. Recommends changes in methods and techniques used

PLASTICS FABRICATOR, DEVELOPMENTAL (Continued)

to fabricate parts, based on developmental fabrication of prototype parts.

D.O.T. Conversion: None 754.281

Starting Hourly Wage Rate For Defense Occupation.....$3.20

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 3 months up to and including 6 months		
PLASTICS BENCH MECHANIC	(aircraft mfg.; fabric. plastics prod.)	754.381	Learn aircraft parts fabrication.		
Canopy Assembler	(aircraft mfg.)	754.381	"	"	
Fiber Worker	(aircraft mfg.)	754.381	"	"	
Plexiglass Former	(aircraft mfg.; fabric. plastics prod.)	754.381	"	"	
Plexiglass Repairman	(aircraft mfg.; fabric. plastics prod.)	754.381	"	"	
FABRICATOR, PLASTICS	(fabric plastics prod.)	754.381	Learn plastic fabrication process.		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 3 months up to and including 6 months		
PATTERN MAKER, PLASTICS	(fabric. plastics prod.)	754.381	Learn patternmaking process.		

Defense Job Title: PRECISION ASSEMBLER

Assembles and tests mechanical assemblies, such as valves, pumps, and nozzles used in rocket propulsion systems: (1) Assembles parts fabricated from metal and synthetics materials: Reads work orders or prints to ascertain assembly procedures. Cleans and deburrs part, using power-driven deburring tool. Drills holes in specified locations, using drill press or hand drill. Assembles units consisting of bearing race, bearing, and seals, using arbor press in clean room. Feels pressure of bearing against seal, with fingers, to ascertain whether unit meets standards, applying job knowledge. Secures parts in fixtures or vises and inserts or stakes bushing, pins, and springs, using standard and modified mechanic's handtools. Screws or bolts parts together according to specifications, using screwdriver and torque wrenches. Performs hand operations, such as lapping and shimming, and machine operations, such as reaming and grinding, to obtain precise fit of parts to specified tolerances. Alines parts, using precision alinement measuring devices. Bonds synthetic parts to metal components, using adhesive. Positions assembly in oven and adjusts controls to regulate temperature and timing in acoordance with directions to cure assembly. Installs and connects related plug in electrical equipment on assemblies. (2) Conducts leak and pressure tests on assemblies: Installs

PRECISION ASSEMBLER (Continued)

specified plumbing and connections on hydraulic testing equipment, using pipe bending and flaring equipment and handtools. Connects assembly to testing equipment and installs pressure gages at specified points. Turns handles that open valves to regulate pressure of gas or liquid flowing through equipment. When testing with gas, turns spigot to fill vat surrounding assembly with water and observes surface of water for air bubbles, indicating leaks. Reads gages and records results on standardized forms. Compares results with specifications to ascertain whether assembly meets standards. (3) Disassembles engines after static firing for cleaning and replaces software: Disassembles engines in shop for post firing inspection and cleaning, using handtools. Reassembles clean components and replaces expended parts, such as gaskets, seals, and rings. Balances components, such as propellers and gears using dynamic balancing equipment. Grinds part with power-driven handtool to remove metal and balance part to specified tolerance. Measures dimensions of part, using micrometers, calipers, feeler gages, and optical flats.

D.O.T. Conversion: None 806.781

Starting Hourly Wage Rate For Defense Occupation.....$3.12

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Anything beyond short demonstration up to and including 30 days		
INTERNAL COMBUSTION-ENGINE SUBASSEMBLER	(engine & turbine)	706.781	Learn to apply job knowledge to assembling internal combustion engines and modify assembly techniques accordingly.	Lower	Good

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			<u>Anything beyond short demonstration up to and including 30 days</u>		
ASSEMBLER-INSTALLER, GENERAL	(aircraft mfg.)	806.781	Learn to use equipment and techniques associated with riveting. One responding employer indicated that the union contract prevented hiring from outside their organization until such time as those already working have an opportunity to apply for it.	Lower	Indeterminate
BENCH MECHANIC, STEEL WELD	(aircraft mfg.)	806.781	Learn to use equipment and procedures associated with tack welding.	Lower	Indeterminate
			<u>Over 30 days up to and including 3 months</u>		
PRECISION ASSEMBLER, BENCH	(aircraft mfg.)	706.781	Learn variations between rocket and aircraft assembly. Adjust to bench work.	Lower	Indeterminate
ASSEMBLER, SHOW MOTOR	(engine & turbine)	806.781	Learn variations between internal combustion and rocket power plants. Learn specific inspection tasks and how to set timing of gears.		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 30 days up to and including 3 months		
INTERNAL COMBUST-ION-ENGINE ASSEMBLER	(engine & turbine)	806.781	Learn variations between internal combustion and rocket power plants. Learn specific inspection tasks and how to set timing of gears. One responding employer indicated individuals would have to go through a formal company training course of 2 weeks duration.	Lower	Good
Diesel-Engine Assembler	(engine & turbine)	806.781	"	"	
Gasoline Engine Assembler	(engine & turbine)	806.781	"	"	
Motorcycle Engine Assembler	(engine & turbine)	806.781	"	"	
Outboard Motor Assembler	(engine & turbine)	806.781	"	"	

Defense Job Title: PROPELLANT MACHINIST

Sets up and operates shop tools, such as bandsaws, bench lathes, and milling machines to cut, turn, and slot prototype samples of solid rocket propellant: (1) Sets up and operates bandsaw to cut propellant: Turns handwheels to raise or lower bed according to size of propellant. Sets guide according to specified length to be cut. Positions propellant stock on bed. Turns on machine and pushes stock against blade to cut propellant to specified length. (2) Sets up and operates bench lathe to turn solid rocket propellant: Reads work orders to ascertain cutting tool to be used, and dimensions and properties of propellant. Turns handwheel to position tailsotck on bed, according to size of workpiece. Secures workpiece in chuck, using wrenches. Mounts cutting tool in tool holder and tightens bolts with wrench. Turns knobs or levers to set rotation speed, cutting rate, and depth of cut according to specifications: Starts machine and turns handwheel to feed tool against workpiece and engage automatic feed. Positions spout of coolant reservoir in order to direct flow of coolant onto workpiece and cutting tool. Bolts tracer attachments to tailstock when automatic tool guide is specified. (3) Sets up and operates milling machine to slot and bore propellant: Positions propellant in holding fixture or clamps it to machine bed. Mounts specified cutter in arbor and tightens bolts with wrench. Turns dials to set cutting speed, feed rate, and depth of cut, according to directions. Starts machine and turns handwheel to feed workpiece against cutting tool or engages automatic feed. Directs flow of coolant onto propellant and cutting tool. (4) Measures machined propellant with gages and micrometers to insure that parts are machined to tolerance of .010.

D.O.T. Conversion: None 694.380

PROPELLANT MACHINIST (Continued)

Starting Hourly Wage Rate For Defense Occupation.....$3.12

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
RUBBER-GOODS CUTTER-FINISHER	(rubber goods)	690.780	None	Lower	Good
Boring Machine Operator	(rubber goods)	690.780	None		
Cutting Machine Operator	(rubber goods)	690.780	None		
Gasket Notcher	(rubber goods)	690.780	None		
Lathe Operator	(rubber goods)	690.780	None		
Notch Machine Operator	(rubber goods)	690.780	None		
Roll Grinder	(rubber goods)	690.780	None		
Washer Cutter	(rubber goods)	690.780	None		

Defense Job Title: PROPELLANT SERVICEMAN

Tends electric-driven pumps to transfer liquid rocket fuel and oxidizers between tank truck and storage facilities near a rocket test stand: (1) Tends pumps to transfer liquid rocket fuel and oxidizers: Connects pump hoses to tank truck containing liquid rocket fuel or oxidizers, and to respective storage facilities, using gaskets, flanges, and bolts. Tightens bolts on connections with wrenches. Starts pump, and opens valves to allow liquids to flow from tank truck to storage facilities. Reads dials that indicate pressure and flow of liquids within hose, and turns handwheels on pumps to increase or decrease pressure, according to specifications. Inspects hoses and hose connections to detect leaks. Stops pumps and replaces defective hoses and connections based on knowledge of excessive leakage. (2) Disconnects fuel lines and valves between test stand fuel storage facility and rocket engine, using wrenches. Removes pipes and valves and loads them on pickup truck. Drives truck to transport pipes to shop for cleaning. (3) Cleans pipes and valves: When cleaning pipes and valves using soaking tank, lifts large items and lowers them into tank containing cleaning solution, using hoist. Removes items from tank after a specified period of time. When cleaning designated items using ultrasonic cleaning equipment, lowers items into tub containing premixed chemical solutions. Turns knobs to adjust wave length and frequency of high frequency sound waves used to clean metal surfaces. Drives forklift to transport drums of cleaning solution from stores area to cleaning vats and drains and refills cleaning vats with premixed chemical solutions, as required. (4) Performs other related tasks: Drives diesel powered trackmobile on railroad tracks to position tank trucks on railroad siding. Replaces worn parts, such as belts and pulleys on pumps.

D.O.T. Conversion: PUMPMAN (any ind.) 914.885

PROPELLANT SERVICEMAN (Continued)

Starting Hourly Wage Rate For Defense Occupation.....$3.12

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
CEMENT PUMP OPERATOR	(const.)	869.782	None	Higher	Fair
CONCRETE-PUMP OPERATOR	(const.)	869.885	None	INA	INA
DREDGE OPERATOR, BRIDGE	(mining & quarrying)	914.885	None		
GAS-TRANSFER MAN	(comp. & liquefied gases)	914.885	None		
			Anything beyond short demonstration up to and including 30 days		
LINE WALKER	(petrol. production; petrol. refin.; pipelines)	914.584	Learn how to repair leaks in pipelines, considering the material being conveyed. One responding employer indicates union contract requires hiring from within company workforce before	No Significant Difference	Poor

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Anything beyond short demonstration up to and including 30 days		
LINE WALKER (Continued)	(petrol production; petrol refin.;pipelines)	914.584	employee may be hired through other sources.		
OIL PUMPER	(petrol. production)	914.782	Develop working knowledge of separator used to separate natural gas from oil. One responding employer indicates union contract requires jobs to be posted for bid by those who are already employed before company may hire from other sources.	Higher	Poor
COAL-PIPE-LINE OPERATOR	(pipelines)	914.782	Develop working knowledge of conveyor systems, pumps, grinding mills, tank agitators, and auxiliary equipment.		
STATION ENGINEER, MAIN LINE	(pipelines)	914.782	Learn various standards on grades of oil and prevention of contamination between grades. One responding	Higher	Fair

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Anything beyond short demonstration up to and including 30 days		
STATION ENGINEER, MAIN LINE (Continued)	(pipelines)	914.782	employer indicates the union contract requires jobs be posted for bid by those who are already employed before company may hire from other sources.		
PUMPMAN, BREWERY	(malt liquors)	914.885	Learn to apply job knowledge to malt liquors industry.		
Bottle-House Pumper	(malt liquors)	914.885	" "		
Celler Pumper	(malt liquors)	914.885	" "		
Wort Pumper	(malt liquors)	914.885	" "		
Yeast Pumper	(malt liquors)	914.885	" "		

Defense Job Title: RESEARCH ASSISTANT

Applies knowledge of science, such as physics and chemistry to perform laboratory tests and experiments and evaluates data delegated by scientists and engineers: (1) Plans test: Confers with scientific or engineering personnel and reads specifications and reports on project design to determine type of study to be conducted, such as prototype materials analysis, chemical processes and solutions development, and missile component testing. Plans test procedures to test devices, such as fuel cells, electrical power devices, reaction control systems, and low thrust measurement devices, based on knowledge of field of specialization and test objectives. Analyzes objectives of experiments in areas of knowledge, such as effects of radiation, effects of vacuums on microwave frequency, and transmission and reflection of light through semi-conductors, and prepares detailed procedures for experiment from broad general outline, under direction of superior. Selects test apparatus and electronic measuring and recording instrumentation, such as spectrum analyzers,signal generators, and oscilloscopes according to knowledge of testing instrumentation and accuracy specified by test objectives. (2) Conducts tests: Builds special test apparatus from wood or metal, using handtools. Designs and builds test aids, such as mirror mounts and light beam interrupters, and attaches them to test apparatus. When working with glass apparatus, blows glass to desired configuration, using techniques of blowing glass. Connects electronic measuring and recording equipment to test apparatus with plugs and cables or installs transducers on test apparatus and constructs test circuitry, using electrician's handtools. Turns knobs and handwheels and pushes buttons to regulate equipment, such as wind tunnel test equipment, flash X-Ray equipment shock tubes, and high vacuum equipment. Prepares specimens for testing by performing such duties as cutting to size, sanding, finishing, curing, or mixing solutions. Starts equipment and observes progress of test or experiment directly, or observes reactions, using equipment, such as cameras, infra-red spectrometers, and other optical measuring devices. Observes screens and dials of measuring and recording instrumentation to insure that equipment functions according to plan and to ascertain interaction of variables under study. Records readings on forms for further analysis. (3) Analyzes data: Applies specified mathematical formulas to reduce data to usable form, according to knowledge of data analysis procedures. Plots data on graphs and charts applying knowledge of coordinate system. Evaluates test or experimental results for consistency and reliability, applying job knowledge gained from experience with tests and test data. Reviews procedures to detect errors in methodology to account for spurious data. Analyzes data and applies knowledge of specialized field to determine whether products being tested meet test objectives or, in case of experiment, whether hypothesis being tested is

RESEARCH ASSISTANT (Continued)

supported by data. Writes preliminary report describing assignment objective, procedures used, test results, and conclusions, and submits report to superior for review and analysis.

D.O.T. Conversion: None 029.281

Starting Hourly Wage Rate For Defense Occupation.....$2.85

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
SPECTROSCOPIST	(profess. & kin.)	011.281	None		
QUALITY CONTROL TECHNICIAN	(profess. & kin.)	019.281	None		
LABORATORY TESTER I	(any ind.)	029.281	None		
Cement Tester	(cement)	029.281	None		
Gas Tester	(chem.; light heat & power; pipelines)	029.281	None		
Paint and Varnish Technician	(paint & varn.)	029.281	None		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
Soils Tester	(profess. & kin.)	029.281	None		
Tester, Ammonia Shipping	(comp. & liquefied gases)	029.281	None		
			Anything beyond short demonstration up to and including 30 days		
TEST TECHNICIAN	(agric. equip.)	019.281	Become oriented to machinery and test equipment.		
ASSAYER	(profess. & kin.)	022.281	Learn use of assaying equipment, methods, and techniques.		
CHEMICAL-LABORATORY TECHNICIAN	(profess. & kin.)	022.281	Learn to set up and operate laboratory test equipment for the purpose of developing new products, materials, and processing methods.		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 30 days up to and including 3 months		
PHYSICAL TESTER	(plastics mat.)	022.281	Learn properties of rubber and learn to operate rubber mill.		
FUEL-RESEARCH ENGINE OPERATOR	(petrol. refin.)	029.281	Learn use of knock meter in testing knock intensity of motor fuels.		
TEST-ENGINE OPERATOR	(petrol. refin.)	029.281	Become familiar with equipment used to test petroleum and learn petroleum analysis.		
TESTER	(petrol. refin.)	029.281	Learn to test physical and chemical properties of petroleum products. Learn use of specialized testing equipment.		
			Over 3 months up to and including 6 months		
ELECTRICAL TECHNICIAN	(profess. & kin.)	003.181	Learn to apply theoretical knowledge of electricity to modify electrical products.		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 3 months up to and including 6 months		
ELECTRONIC TECHNICIAN	(profess. & kin.)	003.181	Apply knowledge of electronics to the modification and troubleshooting of electronic systems.		
MECHANICAL-ENGINEERING TECHNICIAN	(profess. & kin.)	007.181	Learn drafting procedures and become oriented to the development of industrial products.		
CHEMIST, WATER PURIFICATION	(waterworks)	022.281	Learn types and amounts of chemical to add to water for purification purposes. Learn to recognize sources of contamination.		

Defense Job Title: ROCKET TEST TECHNICIAN "A"

Installs, and participates in the testing of, liquid or solid rocket propulsion systems on test stands: (1) Installs power plant on test stand: Operates overhead crane of cherry picker (pneumatic hoist) by pushing levers and depressing pedals to lift power plant off transporter and position power plant on blocks on test stand. Secures power

ROCKET TEST TECHNICIAN "A" (Continued)

plant on test stand with bolts, brackets, and mating flanges, following oral or written instructions. Lays pipe that carries fuel from on-sight storage facility to power plant, according to instructions. Installs pipe fittings and valves, using plumbers' and mechanics' handtools. Wraps insulating material around pipes to protect them from heat of power plant exhaust during firing. Positions firing starting in liquid propellant engine or places squibb or igniter in solid propellant motor and bolts it to mechanism. Screws threaded transducers into specified sockets for the installation of testing equipment, such as pressure meters and flow meters. Plugs electrical fittings on testing equipment into outlets. (2) Participates in functional testing and firing of power plant: Observes movement and responses of electrical and mechanical parts during trial-run to insure that parts function as specified. Informs control-room personnel of actuation and response of parts, using microphone. Monitors instruments in control room during test and records data on form or checks items on list as instructed. (3) Restores test stand to prefiring conditions: Extinguishes fires, dilutes spilled fuel, and washes test stand structure, using water hose. Turns handwheels that open bypass valves to bleed fuel lines. Inspects hardware attached to test stand, such as brackets and supports, and replaces burned parts using handtools. Removes parts, such as transducers and bolts connecting power plant and test stand. Inspects test stand for structural damage. Cuts damaged parts, such as decking and handrails from test stand structure,using oxyacetylene torch. Welds prefabricated metal parts to test stand, using oxyacetylene and arc welder. (4) Maintains cranes and lifting equipment: Inspects crane to detect defective parts. Replaces worn parts, as required. (5) Drives a variety of vehicles, such as modified lumber carriers, trucks, and cranes to transport power plants between shops.

D.O.T. Conversion: None 899.381

ROCKET TEST TECHNICIAN "A" (Continued)

Starting Hourly Wage Rate For Defense Occupation.....$3.55

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Anything beyond short demonstration up to and including 30 days		
AIRCRAFT MECHANIC, RIGGING AND CONTROLS	(aircraft mfg.)	801.381	Learn use of power handtools. One responding employer indicates union contract requires openings be filled by qualified company personnel before hiring through other sources. Another indicates a 3 month company sponsored training course.	Lower	Indeterminate
ASSEMBLER, MINING MACHINERY	(mach.mfg.)	801.381	Learn use of precision measuring instruments.		
GAS-MAIN FITTER	(light, heat, & power)	862.381	Learn use of power handtools and compressor.	Lower	Good
STEAM SERVICEMAN	(light, heat, & power)	862.381	Become familiar with underground steam mains and auxiliary equipment. One responding employer indicates their union contract requires openings be filled by qualified company personnel before hiring through other sources.	INA	INA

Defense Job Title: STRUCTURES ASSEMBLER

Assembles and installs missile structural parts, such as access doors, bulkheads, and sheet metal sections, according to detailed blueprint specifications, applying knowledge of missile assembly techniques, and using handtools and precision measuring instruments: (1) Lays out work: Reviews detailed blueprints, operation sheets, and manuals to ascertain sequence of operations and methods of assembly. Measures and marks mating lines, reference lines, reference points, and rivet, bolt, and fastener hole locations on parts using templates and precision measuring instruments, such as micrometers, calipers and gages, and layout tools, such as scriber, compass, and protractor. (2) Assembles and installs parts: Positions parts in assembly jigs and fixtures, according to detailed assembly blueprint specifications, and using templates. Drills, reams, and countersinks, holes in missile assemblies and missile structure, using portable drill. Fits parts, using handtools, such as pliers, files, and hand shears. Rivets or bolts parts together, using rivet guns or wrench. Installs parts in missile structure, using handtools. (3) Inspects assembly: Inspects subassemblies after installation to assure conformance to blueprint specifications, using precision measuring instruments.

D.O.T. Conversion: None 806.781

Starting Hourly Wage Rate For Defense Occupation.....$2.79

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Anything beyond short demonstration up to and including 30 days		
ASSEMBLER-INSTALLER, GENERAL	(aircraft mfg.)	806.781	Learn aircraft assembly techniques.		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 30 days up to and including 3 months		
BENCH MECHANIC, STEEL WELD	(aircraft mfg.)	806.781	Learn tack welding.		

Defense Job Title: STRUCTURES ASSEMBLER, GENERAL

Assembles and installs initial or subsequent production assemblies and parts of missile structures, such as access doors, bulkheads, and sheet metal sections according to incomplete blueprint specifications, applying knowledge of missile assembly techniques, and using handtools and precision measuring instruments: (1) Lays out work: Reviews incomplete or modified blueprints to ascertain the type of assembly, installation, and mating required. Measures and marks mating lines and reference points on subassemblies and assemblies, following station, butt, and chord lines shown on engineering documents, applying knowledge of layout procedures, and using precision measuring instruments, such as micrometers, calipers, and gages and layout tools, such as scriber, compass and straightedge. (2) Assembles and installs parts: Positions parts in modified assembly jigs and fixtures in relation to each other, according to blueprint specifications, and using templates. Drills, reams, and countersinks holes in missile assemblies and missile structure, using portable drill. Rivets or bolts subassemblies together, using rivet gun and wrench. Removes excess metal from rivet head, using hand mill. Installs parts in missile structure, using handtools. Fabricates and installs such support items as brackets, angles, and stiffeners, using hand forming equipment, such as hand mills, shears, and nibblers, as required. (3) Inspects assembly: Inspects subassemblies after

STRUCTURES ASSEMBLER, GENERAL (Continued)

installation to assure conformance to blueprint specifications, using precision measuring instruments. Confers with company liaison personnel to suggest changes in design or assembly procedures.

D.O.T. Conversion: ASSEMBLER, AIRCRAFT, STRUCTURES AND SURFACES (aircraft mfg.) 806.381

Starting Hourly Wage Rate For Defense Occupation.....$2.98

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Anything beyond short demonstration up to and including 30 days		
AIRCRAFT MECHANIC, RIGGING AND CONTROLS	(aircraft mfg.)	801.381	Learn use of tensionmeter.		
FABRICATOR-ASSEMBLER, METAL PRODUCTS	(any ind.)	809.381	Learn use of fabricating machines and resistance welding machines.	Lower	Good
			Over 30 days up to and including 3 months		
ASSEMBLER, ELECTRO-MECHANICAL	(aircraft mfg.)	806.381	Learn use of hydraulic and pneumatic test equipment.		
ASSEMBLY MECHANIC, EXPERIMENTAL AIRCRAFT	(aircraft mfg.)	806.381	Learn use of test equipment and fabrication techniques.		

Defense Job Title: TEMPLATE MAKER "A"

Lays out, fabricates, and assembles ferrous and non-ferrous metals and alloys to make box, flat, contour, angle, form press, drill, and gage templates used in the production of missile parts: (1) Lays out work: Confers with company liaison personnel, or reviews loft information, engineering blueprints, master models, mockups, and tool designs to ascertain sequence of operations and location of lines of reference and center points on templates. When working from incomplete information, computes dimensions to locate reference lines and center points, applying shop mathematics, trigonometry, and descriptive geometry, and using calculator. Measures and marks lines of reference, guidelines, hole and cutout locations, and center points on workpiece, applying knowledge of layout procedures, and using layout tools such as scriber, divider, and center punch. Joins mating parts of templates and examines coordinating points to verify accuracy of fit. Suggests changes in template design to engineering personnel when interference exists in mating parts or omissions exist in design information, applying knowledge of feasibility of design. Prepares sketches of design changes. (2) Fabricates parts: Sets up and operates sheet metal fabricating machines, such as power shear,foot shear, shrinker, band saw, power brake, power nibblers, drill press, riveter, and spot welder to cut, bend, drill and join sheet metal template parts. Finishes template parts, using sheet metal handtools, such as files, tinsnips, portable shaft grinders, and disc and belt sanders. (3) Assembles template parts: Assembles fabricated template parts, using handtools, such as hammer, pliers, wrenches, mallets, screwdrivers, and portable drills. Measures work to assure conformance to blueprint specifications, using precision measuring instruments, such as micrometers, vernier calipers, and gages. Applies flat paint finish, using aerosol spray can or compressed air spray equipment.

D.O.T. Conversion: TEMPLATE MAKER (any ind.) 601.381

TEMPLATE MAKER "A" (Continued)

Starting Hourly Wage Rate For Defense Occupation.....$3.42

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
TEMPLATE MAKER	(D.O.T. Conversion)				
Template Maker, Aircraft	(aircraft mfg.)	601.381	None		
Template Maker, Sheet Metal	(any ind.)	601.381	None		
Template Maker, Shipbuilding	(ship & boat bldg. & rep.)	601.381	None		
BOILERMAKER, LOFTSMAN	(boilermaking; ship & boat bldg. & rep.)	601.381	None		
			Anything beyond short demonstration up to and including 30 days		
PLASTIC TOOL MAKER	(mach. shop)	601.381	Become familiar with plastics.		
PLASTIC-FIXTURE BUILDER	(mach. tool & access.)	601.381	Learn plastic casting procedures.		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 30 days up to and including 3 months		
DIE FINISHER	(mach. shop)	601.381	Learn die finishing techniques.		
DIE POLISHER	(wire)	601.381	Learn lapping methods and techniques.		
			Over 3 months up to and including 6 months		
DIE MAKER, BENCH, STAMPING	(mach. shop)	601.281	Become familiar with die making procedures.		
DIE MAKER, FOUR-SLIDE MACHINE	(mach. shop)	601.281	Become familiar with four-slide machine die-making procedures.		
DIE SINKER, BENCH	(mach. shop)	601.281	Become familiar with die sinking operations and procedures.		
PROGRESSIVE DIE MAKER	(mach. shop)	601.281	Become familiar with progressive dies.		

Defense Job Title: TESTER, ELECTRONICS

Tests electronic assemblies used in missiles, following established test procedures, and using electronic testing devices: (1) Tests assemblies: Reads test procedures to ascertain type and sequence of tests to be conducted on product, such as single to 5-stage amplifiers, flight control modules, sub-carrier oscillators, power junction boxes, and filter networks. Applies knowledge of electronic testing equipment, such as oscilloscopes, audio-oscillators, signal generators, pulse analyzers, frequency meters, and distortion analyzers, to insure that equipment can measure and record parameters according to specified range and degree of accuracy. Replaces equipment in test console, as required. Turns knobs to time and adjust equipment, following directions. Conducts functional test of measuring and recording equipment to insure that equipment measures and records data within standards, following specified procedures, and using standard electronic instrumentation. Connects testing and recording instruments to assembly being tested, using plugs, leads, and cables. Builds test circuitry, as required, using electricians' handtools. Starts equipment and monitors equipment during test to insure that equipment functions according to standard. Observes dials, screens, and charts and records readings of parameters, such as output, power, frequency, voltages, distortion, and current. (2) Accepts or rejects assemblies based on results of tests: Reads test results and applies knowledge of product specifications to ascertain whether product meets standards. Locates defects, such as wiring errors, open wires, shorts, and faulty components, applying knowledge of electronic theory. Prepares documentation describing results of test and type of defects located. Submits assembly to inspection department for visual checkout.

D.O.T. Conversion: TESTER, SYSTEMS (electronics) 729.381

TESTER, ELECTRONICS (Continued)

Starting Hourly Wage Rate For Defense Occupation.....$3.10

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
ELECTRONIC ASSEMBLER AND TESTER	(bal. & scales)	710.381	None		
DRY-CELL TESTER	(elec. equip)	727.381	None		
WIREMAN, CABLE	(elec. equip)	729.381	None		
Crossbar Frame Wireman	(elec. equip)	729.381	None		
Crossbar Unit Wireman	(elec. equip)	729.381	None		
Switchboard Assembler	(elec. equip)	729.381	None		
TESTER, SYSTEMS	(D.O.T. Conversion)				
Calibration Tester	(electronics)	729.381	None		
Continuity Tester	(electronics)	729.381	None		
Electrical Tester	(electronics)	729.381	None		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
Memory Unit Test Technician	(electronics)	729.381	None		
Television Receiver Analyzer	(electronics)	729.381	None		
Transmitter Tester	(electronics)	729.381	None		
Trouble Shooter	(electronics)	729.381	None		
			Anything beyond short demonstration up to and including 30 days		
PRODUCTION REPAIRMAN	(electronics)	729.381	Learn to apply acquired skills to production repair techniques.		
			Over 30 days up to and including 3 months		
INSPECTOR, HEARING AIDS	(electronics)	712.381	Learn to use steroptiscope and precision measuring equipment.		
ELECTRICAL-EQUIPMENT TESTER	(aircraft mfg.)	729.381	Learn techniques of visual inspection. Learn to adjust electronic equipment.		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 3 months up to and including 6 months		
FINAL TESTER	(elec. equip)	721.381	Learn to test mechanical components and perform required adjustments.		
RELAY TESTER	(light, heat, & power)	729.281	Learn to adjust parts of relays.		

Defense Job Title: TOOL AND DIE MAKER

Analyzes blueprints and engineering sketches, lays out metal stock, sets up and operates machine tools, and fits and assembles parts to make or repair dies, jibs, fixtures, and gages, applying knowledge of tool and die design, shop mathematics and trigonometry, machinability of metals, and assembly procedures: (1) Lays out work: Reviews blueprint and engineering sketches to determine sequence of operations and materials to be used. Computes dimensions and angles of workpiece applying shop mathematics and trigonometry and using sine bars and protractor. Marks center points and lines of reference on ferrous and non-ferrous metal, alloy, and plastic stock, using layout tools, such as scribers, dividers, and center punch. (2) Sets up and operates machine tools: Sets up and operates such machines as profiling machine, horizontal boring mill, shaper, milling machine and surface grinder to machine metal tools, dies, and fixtures, applying knowledge of machinability of metals. Applies and rubs abrasive compound on workpiece by hand to lap surface to exacting tolerances. Verifies conformance to blueprint specifications,

TOOL AND DIE MAKER (Continued)

using precision measuring instruments such as micrometers, calipers, and gages. (3) Fits and assembles parts: Lifts machine parts onto surface plate or work table by hand or using floor hoist. Positions parts on table and secures them to table, using V-vlocks and angle plates. Removes burrs and surface irregularities from straight or contoured surfaces of machines parts, using power grinder and handtools, such as scrapers and abrasive stones. Verifies dimensions, alinements, and clearances, of machined parts, using precision measuring instruments, such as micrometers, gages, dial indicators, sine bars, Jo Blocks, and gage blocks. Fits and bolts parts together using handtools, such as hammers and wrenches.

D.O.T. Conversion: TOOL-AND-DIE MAKER (mach. shop) 601.280

Starting Hourly Wage Rate For Defense Occupation.....$3.64

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 30 days up to and including 3 months		
MAINTENANCE MACHINIST	(any ind.)	600.280	Learn machine repair procedures.		
MACHINIST I	(mach. shop)	600.280	Learn machining procedures.		
MACHINIST, EXPERIMENTAL	(mach. shop)	600.280	" "		
DIE-MAKER, DIE-CASTING AND PLASTIC MOLDING	(mach. shop)	601.280	Become familiar with compression mold dies.		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 30 days up to and including 3 months		
Die Repairman, Die-Casting And Plastic Molding	(mach. shop)	601.280	Become familiar with compression mold dies.		
DIE MAKER, STAMPING	(mach. shop)	601.280	Become familiar with stamping dies.		
Die Repairman, Stamping	(mach. shop)	601.280	" "		
DIE MAKER, TRIM	(mach. shop)	601.280	Become familiar with trimmer dies.		
Die Repairman, Trimmer Dies	(mach. shop)	601.280	" "		
DIE MAKER, WIRE DRAWING	(mach. shop)	601.280	Become familiar with wire drawing dies.		
Carbide-Die Maker	(mach. shop)	601.280	" "		
Diamond-Die Maker	(mach. shop)	601.280	" "		
DIE SINKER	(mach. shop)	601.280	Become familiar with forging dies.		
Die Repairman, Forging	(mach. shop)	601.280	" "		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 30 days up to and including 3 months		
EDGER MAN	(mach. shop)	601.280	Become familiar with forging dies.		
TOOL MACHINE SET-UP OPERATOR	(mach. shop)	601.280	Learn custom and production methods and procedures.		
TOOL MAKER	(mach. shop)	601.280	Learn tool making procedures.		
Tool Repairman	(mach. shop)	601.280	" "		
DIE MAKER, BENCH, STAMPING	(mach. shop)	601.281	Become familiar with stamping dies.		
DIE MAKER, FOUR-SLIDE MACHINE	(mach. shop)	601.281	Learn progressive die construction.		
DIE SINKER, BENCH	(mach. shop)	601.281	Become familiar with forging dies.		
PROGRESSIVE-DIE MAKER	(mach. shop)	601.281	Learn progressive die construction.		
TOOL MAKER, BENCH	(mach. shop)	601.281	Learn tool making procedures.		
Gage Maker	(mach. shop)	601.281	" "		
Jig-And-Fixture Maker	(mach. shop)	601.281	" "		
Tool Repairman, Bench	(mach. shop)	601.281	" "		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 3 months up to and including 6 months		
DIE-TEMPLATE MAKER, EXTRUSION	(mach. shop)	601.280	Learn template making procedures.		

Defense Job Title: TOOL, JIG AND FIXTURE BUILDER

Analyzes specifications, lays out metal stock, and sets up and operates metal working machines to fabricate tools, jigs, and fixtures used in the manufacture of rocket components: (1) Lays out parts: Reads work orders, sketches, and blueprints to determine product to be fabricated, such as drill fixtures, molds, templates, jigs, and special machinery. Performs two and three dimensional lay outs on metal stock, using work aids, such as protractors, sine bars, scales (straightedge), and scribe. Computes tooling reference points and locates dimensions in various planes requiring three dimensional projection from flat views, according to knowledge of trigonometry. Saws metal stock to size, using cutoff saw and files edges. (2) Sets up and operates metal machining equipment and assembles products: Selects machine tools, such as milling machines, lathes, jig bores, boring mills, and shapers according to sequence of operations, dimensions to be machined, and knowledge of machine shop practice. Selects type of cutting tools, such as carbide or high speed, according to composition of workpiece, and mounts tool on toolpost or spindle. Places workpiece on machine bed manually, or using overhead crane and positions workpiece, using angle and knee blocks, templates and shims. Secures workpiece to table with clamps or bolts. Verifies accuracy of lay out, using measuring devices such as gages,

TOOL, JIG AND FIXTURE BUILDER (Continued)

sine bars and rotabs (optical measuring device to verify accuracy of angles). Selects variables, such as rate of feed, speed of rotation, and depth of cut according to knowledge of machining techniques and adjusts control accordingly. Turns handwheel to bring cutting tool into contact with workpiece and engages automatic feed. Drills holes in machined components, using drill press. Smooths parts, using pedestal grinder and belt sander. Laps, hones, reams,and polishes parts to specifications, using handtools. Operates oxyacetylene torch to heat treat parts. Compares color of part being treated with data on color charts to ascertain when part has reached specified temperature. Quenches part in vat of oil or water. Measures dimensions and angles of component, using surface plates, cadillac gages, Jo blocks, sine bars, and rotabs. Assembles parts following specified techniques or according to knowledge gained from experience, using arbor press and handtools. (3) Occasionally fabricates components from synthetic materials, such as styrofoam, rubber, nylon, and fiberglass using metal working machines.

D.O.T. Conversion: TOOL MAKER (mach. shop) 601.280

Starting Hourly Wage Rate For Defense Occupation.....$3.70

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
HOROLOGICAL-TOOL-AND-DIE MAKER	(clock & watch)	601.280	None		
PINION-MASTER-FORM-AND-CUTTER MAKER	(clock & watch)	601.280	None		
SWISS-JIG-BORER-AND-GRINDER TECHNICIAN	(clock & watch)	601.280	None		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
DIE MAKER, DIE-CASTING AND PLASTIC MOLDING	(mach. shop)	601.280	None		
Die Repairman, Die Casting and Plastic Molding	(mach. shop)	601.280	None		
DIE MAKER, STAMPING	(mach. shop)	601.280	None		
Die Repairman, Stamping	(mach. shop)	601.280	None		
DIE-TEMPLATE MAKER, EXTRUSION	(mach. shop)	601.280	None		
TOOL-MACHINE SET-UP OPERATOR	(mach. shop)	601.280	None		
TOOL MAKER	(D.O.T. Conversion)				
Tool Repairman	(mach. shop)	601.280	None		
			Over 3 months up to and including 6 months		
DIE MAKER, TRIM	(mach. shop)	601.280	Learn to assemble dies. Learn various acceptable clearances and fits of dies considering material being produced. Learn characteristics of metals or plastics undergoing trimming.		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 3 months up to and including 6 months		
Die Repairman, Trimmer Dies	(mach. shop)	601.280	Same Retraining as for DIE MAKER, TRIM.		
TOOL-AND-DIE MAKER	(mach. shop)	601.280	Learn techniques of fitting and finishing dies.		
Tool and Die Repairman	(mach. shop)	601.280	" "		

Defense Job Title: VEHICLE TEST SHOP MECHANIC

Plans, lays out, develops, repairs, overhauls, and shop tests special mechanical and electrical flight testing equipment, ground support equipment, and experimental parts and assemblies for missiles, following drawings, sketches, and written and verbal instructions: (1) Lays out work: Reviews detailed engineering and assembly blueprints and incomplete verbal, written, and sketch information to ascertain sequence of operations, and parts and materials necessary to construct, repair, or overhaul missile components, applying knowledge of instrumentation theory, practice, and procedures. Measures, marks, and scribes lines and reference points on materials, applying knowledge of geometry and trigonometry, and using layout tools, such as scriber, straightedge, and compass. (2) Fabricates and assembles parts: Sets up and operates such machine tools as bench lathe, hand mill, and grinder, and such fabricating machines as drill press, brake, and shear to fabricate instrument panels, chassis, support frames, radio boxes and similar missile parts, applying knowledge of forming and machining characterisitcs of metals and

VEHICLE TEST SHOP MECHANIC (Continued)

and their alloys. Assembles parts in holding fixtures, using handtools, such as wrenches screwdrivers, and pliers. Inspects parts to insure conformance to blueprint specifications, using templates and precision measuring instruments, such as calipers, gages, and micrometers. (3) Installs parts: Examines missile structure to ascertain method of installation. Modifies part, as necessary, using machine tools or handtools. Installs missile parts and test devices, such as thermocouples, camera equipment, pressure indicators, and strain gages in missile structure, using mechanics' and electricians' handtools. Removes and reworks parts to obtain specified fit. Repairs and overhauls malfunctioning missile parts or testing devices. Suggests design changes to engineering personnel, applying knowledge of structures, power plant and functional systems.

D.O.T. Conversion: FLIGHT-TEST SHOP MECHANIC (aircraft mfg.) 621.381

Starting Hourly Wage Rate For Defense Occupation.....$3.49

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			No additional training or short demonstration only		
MACHINE OPERATOR I	(any ind.)	616.380	None		
SHEET-METAL-FABRICATING-MACHINE OPERATOR	(any ind.)	616.380	None		
SHEET-METAL WORKER	(any ind.)	804.281	None		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 30 days up to and including 3 months		
CARBURETOR MAN	(air trans.)	621.281	Learn carburetor repair procedures and vacuum pump operations.		
ASSEMBLER, AIRCRAFT POWER PLANT	(aircraft mfg.)	621.381	Learn aircraft engine and auxiliary parts installation and soldering.		
MECHANIC, FLOWMETER TEST AND CERTIFICATION	(aircraft mfg.)	621.381	Learn functional testing, inspecting, and adjustment practices.		
PNEUMATIC TESTER AND MECHANIC	(aircraft mfg.)	621.381	Learn pneumatic test equipment operations and procedures.		
			Over 3 months up to and including 6 months		
AIRCRAFT-AND-ENGINE MECHANIC	(aircraft mfg.; air trans.)	621.281	Learn manual procedures, engine test operations, and pneumatic and hydraulic systems repair.		
Aircraft-Engine Assembler	(air trans.)	621.281	" "		

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements	Hourly Wage Comparison	Job Outlook
			Over 3 months up to and including 6 months		
Aircraft-Engine Cylinder Mechanic	(air trans.)	621.281	Learn manual procedures, engine test operations, and pneumatic and hydraulic systems repair.		
Aircraft-Engine Dismantler	(aircraft mfg.; air trans.)	621.281	" "		
Aircraft-Engine Installer	(air trans.)	621.281	" "		
Aircraft-Engine Mechanic	(air trans.)	621.281	" "		
Aircraft-Engine Mechanic Overhaul	(aircraft mfg.; air trans.)	621.281	" "		
AIRCRAFT-AND-ENGINE MECHANIC, LINE SERVICE	(air trans.)	621.281	Learn line station operations.		
EXPERIMENTAL MECHANIC II	(air trans.)	621.281	Learn aircraft inspection, test, electrical and installation requirements. Learn manual procedures and pneumatic and hydraulic systems repair.		

Technical Appendix B

DEFENSE OCCUPATIONS FOR WHICH DETAILED JOB ANALYSIS SCHEDULES WERE NOT PREPARED, WITH RELATED COUNTERPART OCCUPATIONS RANKED BY LENGTH OF RETRAINING

This appendix lists the defense occupations for which counterpart occupations were readily identifiable without detailed job analysis. Generally, they were not as strictly defense-unique as those in Technical Appendix A. Some of the occupations in Appendix B are recorded because the sheer number of defense workers involved will create transfer problems. The defense occupations are listed in alphabetical order and their related counterpart occupations are categorized according to the length of retraining required.

Out of the 127 occupations studied, there were a total of 28 defense occupations for which counterparts were readily identifiable without detailed job analysis information. There were 14 occupations which existed at both plants and were similar enough for our purposes to consider them as one occupation. In these cases, the most descriptive title was selected.

There was a total of 224 job combinations identified in Appendix B. Because there were instances where a single occupation was found to be the counterpart of two or more defense occupations, a number of counterpart occupations appeared more than once in Appendix B. The total of unduplicated counterpart occupations, listed in Appendix B, was 199.

EXPLANATION OF ITEMS SHOWN IN TECHNICAL APPENDIX B

Defense Job Title

The plant title of the analyzed defense occupation was used. An asterisk following the defense job title indicates that the job was found at both plants. When the titles were not the same in both plants, the most descriptive title was selected for use. The first statement following the job title gives an overall summary of the defense occupation. Following the summary statement, the specific duties are identified.

D.O.T. Conversion

When a job in the D.O.T. was found to be identical with the defense occupation in all significant respects, the D.O.T. job title, industry designation, and code have been entered. If no such job could be identified in the D.O.T., the word "None" followed by a code derived from the analysis of the job duties has been entered. The D.O.T. conversion can be considered the closest counterpart to the defense occupation except when the conversion was found in a defense-oriented industry.

Counterpart Occupations, D.O.T. Titles

Counterpart occupations of the defense occupation are listed in the left hand column. They are ranked according to the length of training required--shortest to longest. Where two or more counterpart occupations fall in the same training category, they are listed in the order of D.O.T. code number. In the event of identical code numbers, the entries are arranged alphabetically by industrial designation and finally in alphabetic order by job title.

D.O.T. Industrial Designation

This column identifies the D.O.T. industrial designation assigned to the definition. Each D.O.T. definition was assigned one or more of these designations for the purpose of indicating the type of economic activity with which the job was associated.

D.O.T. Code

This column identifies the D.O.T. code assigned to the occupation.

Minimum Retraining Requirements

These are the occupational analysts' evaluation of the nature and extent of retraining the defense jobholder must undergo in order to function effectively in the counterpart occupation. The categories of training time used to rank the counterpart occupations are:

1. No additional training or short demonstration only.

2. Anything beyond short demonstration up to and including 30 days.

3. Over 30 days up to and including 3 months.

4. Over 3 months up to and including 6 months.

Wage comparison and job outlook information are not available for the occupations in this table because these occupations were not surveyed.

Defense Job Title: AIR CONDITIONING MECHANIC*

Installs, maintains, repairs, and overhauls plant air conditioning, ventilating, and refrigeration systems or heating equipment, applying knowledge of maintenance shop practice and procedures, and using mechanics' handtools: (1) Determines need for maintenance: Reviews refrigeration and heating systems at regular intervals to determine maintenance and repair work necessary to prevent functional breakdowns. (2) Repairs equipment: Disassembles air conditioning equipment to gain access to malfunctioning part, using mechanics' handtools. Measures part to obtain dimensions, using precision measuring instruments. Sketches warn or defective part for use by machine tool operators. Repairs and replaces such items as crank shafts, bearings, pistons, valves, condensers, and thermostats. (3) Tests system: Starts air conditioning system to test functional operations of equipment. Adjusts timing, alinement, and clearances; and calibrates thermostats and controls to achieve operational efficiency, using handtools. Fills system with refrigerant and tests it for leaks, using pressure testing device.

D.O.T. Conversion: REFRIGERATION MECHANIC (any ind.) 637.281

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Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			No additional training or short demonstration only
AIR-CONDITIONING MECHANIC, DOMESTIC	(any ind.)	637.281	None
EVAPORATIVE-COOLER INSTALLER	(any ind.)	637.381	None
GAS-EQUIPMENT-AND-CONTROL MAN	(light, heat, & power)	637.281	None

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			No additional training or short demonstration only
GAS SERVICEMAN	(light, heat, & power)	637.281	None
REFRIGERATION UNIT REPAIRMAN	(refrigerat. equip.)	637.381	None
			Over 30 days up to and including 3 months
GAS APPLIANCE SERVICEMAN	(any ind.)	637.281	Learn use of test equipment, pipe threading procedures and gas appliance characteristics.
Gas-Refrigerator Serviceman	(any ind.)	637.281	" "
Gas-Stove Serviceman	(any ind.)	637.281	" "
			Over 3 months up to and including 6 months
AIR-CONDITIONING MECHANIC, COMMERCIAL	(any ind.)	637.281	Learn welding and sheet metal fabricating machine operation.
Air-Conditioning Mechanic, Industrial	(any ind.)	637.281	" "

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			Over 3 months up to and including 6 months
Plumber-Pipe-Fitter, Central-Heating-and-Air-Conditioning	(any ind.)	637.281	Learn welding and sheet metal fabricating machine operation.

Defense Job Title: ASSEMBLER, METAL BONDING

Sets up and operates hydraulic press equipped with heated platens to bond metal missile parts and assemblies: Reviews process charts and blueprints to determine sequence of operations, amount of bonding agent to be applied, and areas to be bonded. Removes dust, dirt, oil, or other foreign matters from surfaces of missile parts to insure specified contact between surfaces. Removes burrs, waves, and other surface imperfections, using handtools. Sprays metal bonding film or adhesive on surfaces of parts to be bonded. Dries parts and assemblies, using vacuum fixtures or presses equipped with heated platen. Places dried parts and assemblies in oven. Adjusts pressures, heating temperatures, and length of curing time according to specifications. Removes items from oven after specified period of time. Assembles parts and assemblies by trimming, filing, drilling, riveting, hand routing, reforming, and fitting.

D.O.T. Conversion: METAL-BONDING PRESS OPERATOR (aircraft mfg.) 806.782

ASSEMBLER, METAL BONDING (Continued)

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements Anything beyond short demonstration up to and including 30 days
DRIER OPERATOR II	(chem.)	553.782	Thirty days to become familiar with chemical processing operations and conveyor systems.
Continuous-Conveyor-Screen Drier	(chem.)	553.782	" "
POT FIREMAN	(chem.)	553.782	Thirty days to learn standards for control of boiling and temperature settings.
VARNISH MAKER	(ink; paint & varn.)	553.782	Thirty days to learn use of agitators and pumps and to learn standards for setting temperature controls.
BELT-PRESS OPERATOR I	(rubber goods)	553.782	Thirty days to become familiar with double deck platen curing press.
CUREMAN, FOAM RUBBER	(rubber goods)	553.782	Thirty days to become familiar with conveyor, pumps, and scales.

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			Anything beyond short demonstration up to and including 30 days
V-BELT CUREMAN	(rubber goods)	553.782	Thirty days to become familiar with rubber curing process.
			Over 30 days up to and including 3 months
FORGING-PRESS OPERATOR I	(forging)	611.782	Three months to become familiar with forging operations.
PLATEN-PRESS OPERATOR	(paper goods)	641.782	Two months to become familiar with platen press.
ROLLER-MACHINE OPERATOR	(spring)	611.782	Three months to become familiar with die installation and furnace operation.
BRAZER, RESISTANCE I	(welding)	810.782	Three months to become familiar with resistance brazing process.
WELDER, BUTT I	(welding)	810.782	Three months to become familiar with butt welding process.
WELDER, SEAM I	(welding)	810.782	Three months to become familiar with seam welding process.

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			Over 30 days up to and including 3 months
WELDER, SPOT I	(welding)	810.782	Three months to become familiar with spot welding process.
Welder, Multiple Spot	(welding)	810.782	" "
WELDING-MACHINE OPERATOR, ARC	(welding)	810.782	Three months to become familiar with arc welding process.
WELDING-MACHINE OPERATOR, GAS-SHIELDED ARC	(welding)	810.782	Three months to become familiar with inert gas welding.
Tungsten-Welding-Machine Operator, Inert Gas	(welding)	810.782	" "
WELDING-MACHINE OPERATOR, SUBMERGED ARC	(welding)	810.782	Three months to learn submerged arc welding process.

Defense Job Title: CARPENTER, MAINTENANCE*

Maintains, modifies, and constructs wooden structures, such as cabinets, partitions, and framework, using carpenters' handtools and power tools: (1) Lays out work: Analyzes blueprints and sketches to determine sequence of operations and type and amount of materials needed. Lays out lines of reference, using pencil, straightedge, compass, and ruler. (2) Constructs structure: Cuts wood stock to size, using hand or power saw. Constructs cabinets, partitions, and building, using carpenters' handtools, such as hammer, saw, screwdriver, and wrench. (3) Performs miscellaneous maintenance duties: Installs or replaces insulation, floor and acoustical tile, glass, sheet rock, slate, and composition roofing, using carpenters' hand- and power- tools.

D.O.T. Conversion: CARPENTER, MAINTENANCE (any ind.) 860.281

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			No additional training or short demonstration only
CARPENTER, INSPECTOR	(any ind.)	860.281	None
CARPENTER, MAINTENANCE	(D.O.T. Conversion)		
Carpenter, Bank	(mining & quarrying)	860.281	None
Carpenter, Breaker	(mining & quarrying)	860.281	None
Carpenter, Car	(mining & quarrying)	860.281	None
Carpenter, Hotel	(hotel & rest.)	860.281	None
Carpenter, House	(any ind.)	860.281	None
Carpenter, Mill	(any ind.)	860.281	None

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			No additional training, or short demonstration only
Carpenter, Mine	(mining & quarrying)	860.281	None
Carpenter, Office Building	(any ind.)	860.281	None
Carpenter, Plant	(any ind.)	860.281	None
Flume Man	(mining & quarrying)	860.281	None
Frame Maker	(leather mfg.)	860.281	None
Meat-Cutting-Block Repairman	(any ind.)	860.281	None
FORM BUILDER	(const.)	860.381	None
FORM SETTER, WOOD FORMS	(const.)	860.381	None
			Anything beyond short demonstration up to and including 30 days
ACOUSTICAL CARPENTER	(const.)	860.381	Thirty days to learn acoustical tile installation techniques.
BUILDING-INSULATING CARPENTER	(const.; ret. tr.)	860.381	Thirty days to learn insulation installation techniques.
CARPENTER, BRIDGE	(r. r. trans.)	860.381	Thirty days to learn identification of decayed, split or crooked timbers and methods of repair.

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			Anything beyond short demonstration up to and including 30 days
JOINER	(ship & boat bldg. & rep.)	860.381	Thirty days to learn marine carpentry requirements and techniques.
			Over 3 months up to and including 6 months
CARPENTER, STREETCAR	(loco. & car bldg. & rep.)	860.281	Three months to four months to learn structural requirements of streetcar.
CARPENTER, SHIP'S	(water trans.)	860.281	Three months to four months to learn ship carpentry techniques and regulations and structural requirements.
CARPENTER	(const.)	860.381	Three months to four months to learn building codes.
Carpenter, Refrigerator	(refrigerat. equip.)	860.381	" "
Combination Window Installer	(const.)	860.381	" "
Door Hanger	(const.)	860.381	" "
Finished-Hardware Erector	(const.)	860.381	" "
Framing Carpenter	(const.)	860.381	" "
Garage-Door Hanger	(const.)	860.381	" "

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			Over 3 months up to and including 6 months
Hardwood-Floor Layer	(const.)	860.381	Three months to four months to learn building codes.
House Carpenter	(const.)	860.381	" "
Jalouise Installer	(const.)	860.381	" "
Lay-Out Carpenter	(const.)	860.381	" "
Overhead-Garage-Door Hanger	(const.)	860.381	" "
Parquetry-Floor Layer	(const.)	860.381	" "
Stair Builder	(const.)	860.381	" "
Trim Setter	(const.)	860.381	" "
Weather Stripper	(const.)	860.381	" "
Wood-Sash-and-Frame Carpenter	(const.)	860.381	" "
Wood-Strip-Block Floor Layer	(const.)	860.381	" "

Defense Job Title: DRILL PRESS OPERATOR "A"

Sets up and operates a variety of hand- or power- fed drill presses to drill, ream, bore, tap, and spotface holes on missile parts: (1) Lays out work: Reviews detail blueprints, sketches, and manufacturing sheets to ascertain sequence of operations, methods of

DRILL PRESS OPERATOR "A" (Continued)

loading, positioning, and fastening workpiece in jig, and material used. Measures and marks location of holes on metal workpiece, using layout tools. (2) Sets up machine: Mounts workpiece in jig or fixture and adjusts fixture on bed of machine, using wrench. Sets machine speed, feed, and depth of cut, applying knowledge of the machinability of metals. Selects cutting tool and mounts it in spindle of machine, using chuck wrench. (3) Operates machine: Turns handle manually or engages automatic feed to drill bore, ream, tap, and spotface holes in metal missile parts. (4) Inspects work: Inspects finished work to assure conformance with blueprint specifications, using precision measuring instruments, such as micrometers, calipers, gages, surface plate, and dial indicators.

D.O.T. Conversion: DRILL-PRESS SET-UP OPERATOR, MULTIPLE SPINDLE (mach. shop) 606.380

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			No additional training or short demonstration only
DRILL-PRESS SET-UP OPERATOR, RADIAL	(mach. shop)	606.380	None
DRILL-PRESS SET-UP OPERATOR, RADIAL, TOOL	(mach. shop)	606.380	None

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			Anything beyond short demonstration up to and including 30 days
BORING-MACHINE SET-UP OPERATOR, HORIZONTAL	(mach. shop)	606.280	Thirty days to become familiar with jig boring operations.
BORING-MACHINE SET-UP OPERATOR, JIG	(mach. shop)	606.280	Thirty days to become familiar with jig boring operations.

Defense Job Title: ELECTRICIAN, MAINTENANCE INDUSTRIAL*

Repairs, installs, and maintains plant electrical systems and equipment, according to wiring and circuit diagrams, using electricians' handtools, and applying knowledge of electrical theory and construction codes: (1) Locates malfunction: Locates and determines electrical malfunctions, using electrical test instruments, such as ammeter, oscilloscopes, and test lamp. Analyzes data contained on such items as schematic drawings, wiring diagrams, and electric motor specifications to determine reason for malfunction. (2) Repairs malfunction: Computes load requirements, applying knowledge of mathematics. Replaces burned or worn wires, conduit, or electric motors, using electricians' handtools, and applying knowledge of municipal safety codes and underwriters specifications. (3) Installs and maintains electrical equipment: Installs motors, transformer banks, welding generators, panels, and switchboards. Taps, splices, and insulates high voltage wires and performs emergency repairs on hot circuits. Inspects and repairs electrical accessories, control devices, and wiring on overhead

ELECTRICIAN, MAINTENANCE INDUSTRIAL* (Continued)

electric cranes, hoisting equipment, and plant machines and equipment. (4) Rebuilds electrical equipment: Disassembles motors, generators, and transformers to determine nature and extent of malfunction. Replaces worn or defective electrical parts or wiring.

D.O.T. Conversion: ELECTRICAL REPAIRMAN (any ind.) 829.281

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			No additional training or short demonstration only
ELECTRICAL REPAIRMAN	(D.O.T. Conversion)		
Electrician, Crane Maintenance	(any ind.)	829.281	None
Electrician, Machine Shop	(mach. shop)	829.281	None
Electrician, Refinery	(petrol. refin.)	829.281	None
Time-Clock Repairman	(elec. equip.)	829.281	None
SOUND TECHNICIAN	(any ind.)	829.281	None
COMPLAINT INSPECTOR	(light, heat, & power)	829.281	None
UNDERGROUND REPAIRMAN	(light, heat, & power)	829.281	None
WIREMAN, MAINTENANCE	(light, heat, & power)	829.281	None

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			No additional training or short demonstration only
WATCH ELECTRICIAN	(tel. & tel.)	829.281	None
EQUIPMENT INSTALLER	(any ind.)	829.381	None
			Over 30 days up to and including 3 months
ELEVATOR REPAIRMAN	(any ind.)	829.281	Three months to learn elevator repair techniques and building safety standards.
AUTOMATIC-DOOR SERVICEMAN	(const.)	829.281	Two months to three months to become familiar with automatic door installation methods and techniques.
ORGAN TUNER, ELECTRONIC	(any ind.)	829.381	Two months to learn application of electronic test equipment to organ tuning.
CIRCULATING-PROCESS INSPECTOR	(elec. equip.)	829.381	Two months to three months to learn use of precision measuring instruments.
CABLE SPLICER	(light, heat, & power)	829.381	Two months to learn cable splicing techniques.
Jointer, Submarine Cable	(tel. & tel.)	829.381	" "

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			Over 3 months up to and including 6 months
DENTAL-EQUIPMENT INSTALLER AND SERVICE-MAN	(whole tr.)	829.281	Three months to four months to learn installation techniques used for pneumatic and hydraulic installations.

Defense Job Title: ELECTROPLATER

Sets up and operates electroplating equipment to plate metallic and non-metallic missile parts, applying knowledge of electrolytic process: (1) Reviews data: Reviews blueprints, verbal instructions, and planning sheets to ascertain sequence of operations, type and amount of solutions to be used, parts masking, and voltage and amperage required. Ascertains type or form of racks and hangers required to assure complete and uniform plating deposit on all surfaces. (2) Plates parts: Connects electrical terminals to part, using screwdriver or wrench. Turns dials to set amperage and voltage and immerses part in solution for specified time, applying knowledge of electrolytic process. Removes part from solution. Inspects part to assure conformance to blueprint specifications, using precision measuring instruments.

D.O.T. Conversion: PLATER (electroplating) 500.380

ELECTROPLATER (Continued)

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			No additional training or short demonstration only
PLATER	(D.O.T. Conversion)		
Brass Plater	(electroplating)	500.380	None
Bronze Plater	(electroplating)	500.380	None
Cadmium Plater	(electroplating)	500.380	None
Copper Plater	(electroplating)	500.380	None
Gold Plater	(electroplating)	500.380	None
Nickle Plater	(electroplating)	500.380	None
Silver Plater	(electroplating)	500.380	None
Tin Plater	(electroplating)	500.380	None
PLATER, PLASTICS	(fabric. plastics prod.)	500.380	None

Defense Job Title: ENGINE LATHE OPERATOR "A"

Sets up and operates engine lathe to machine metal parts used in the production of missiles: (1) Lays out work: Reviews blueprint specifications to ascertain sequence of

ENGINE LATHE OPERATOR "A" (Continued)

operations, type and amount of materials to be used, and tooling required. Lays out lines of reference and center points on workpiece, using layout tools. (2) Sets up machine: Mounts workpiece in holding fixture or chuck, using wrench. Selects and mounts cutting tool, using wrench. Sets and adjusts machine speeds and feeds, applying knowledge of machinability of metals. (3) Operates machine: Starts machine. Engages automatic feed to cut workpiece to specified dimensions. Operates lathe to perform such typical operations as turning, facing, drilling, boring, grooving, reaming, and tapping. (4) Inspects work: Inspects completed work to assure conformance with blueprint specifications, using precision measuring instruments or templates.

D.O.T. Conversion: ENGINE LATHE SET-UP OPERATOR (mach. shop) 609.380

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			No additional training or short demonstration only
ENGINE-LATHE SET-UP OPERATOR	(D.O.T. Conversion)		
Tracing-Lathe Set-Up Operator	(mach. shop)	609.380	Learn to set up and operate tracing lathe.
			Over 30 days up to and including 3 months
SCREW-MACHINE SET-UP OPERATOR, MULTIPLE SPINDLE JOBBING	(mach. shop)	604.280	Learn to set up and operate multiple-spindle lathe-type screw machines.

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			Over 30 days up to and including 3 months
SCREW-MACHINE SET-UP OPERATOR, SINGLE SPINDLE, JOBBING	(mach. shop)	604.280	Learn to set up and operate single-spindle lathe-type screw machines.
CHUCKING-MACHINE SET-UP OPERATOR	(mach. shop)	604.380	Learn to set up and operate single- or multiple- spindle horizontal chucking machines.
CHUCKING-MACHINE SET-UP OPERATOR, MULTIPLE SPINDLE, VERTICAL	(mach. shop)	604.380	Learn to set up and operate multiple-spindle vertical chucking machines.
SET-UP MAN, AUTOMATIC SPINNING-AND-BEADING-LATHE	(mach. shop)	604.380	Learn to set up automatic spinning lathe equipped with slitter or knife, and beading rolls.
TURRET-LATHE SET-UP OPERATOR	(mach. shop)	604.380	Learn to set up and operate turret lathes.
			Over 3 months up to and including 6 months
ENGINE-LATHE SET-UP OPERATOR, TOOL	(mach. shop)	604.280	Learn to set up and operate turret lathe to fabricate machine, tool, and die parts.

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			Over 3 months up to and including 6 months
SCREW-MACHINE SET-UP MAN, MULTIPLE SPINDLE, JOBBING	(mach. shop)	604.280	Learn to set up multiple spindle lathe-type screw machines.
SCREW-MACHINE SET-UP MAN, SINGLE SPINDLE, JOBBING	(mach. shop)	604.280	Learn to set up single-spindle lathe-type screw machines.
TURRET-LATHE SET-UP OPERATOR, TOOL	(mach. shop)	604.280	Learn to set up and operate turret lathe to fabricate machine, tool, and die parts.
Chucking-Machine Set-Up Operator, Tool	(mach. shop)	604.280	Learn to set up and operate chucking machine to fabricate machine, tool, and die parts.
Screw-Machine Set-Up Operator, Tool	(mach. shop)	604.280	Learn to set up and operate screw machine, to fabricate machine, tool, and die parts.
Turret-Lathe Set-Up Operator, Tool, Vertical	(mach. shop)	604.280	Learn to set up and operate turret lathe to fabricate machine.
CHUCKING-MACHINE SET-UP MAN	(mach. shop)	604.380	Learn to set up single or multiple-spindle chucking machines.

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			Over 3 months up to and including 6 months
LATHE SET-UP MAN	(mach. shop)	604.380	Learn to set up and operate a variety of lathes for production workers.
SCREW-MACHINE SET-UP MAN, PRODUCTION	(mach. shop)	604.380	Learn to set up single- or multiple-spindle lathe-type screw machines.
SET-UP MAN, AUTOMATIC SPINNING LATHE	(mach. shop)	604.380	Learn to set up automatic spinning lathe.
TURRET-LATHE SET-UP MAN	(mach. shop)	604.380	Learn to set up turret lathes.
THREADING MACHINE SET-UP MAN	(mach. shop)	609.380	Learn to set up single- or multiple-spindle threading machines.

Defense Job Title: GRINDER, TOOL AND CUTTER*

Sets up and operates a variety of grinding machines to form, grind, and sharpen machine tools and cutters used in the production of missiles, applying knowledge of tool grinding

GRINDER, TOOL AND CUTTER* (Continued)

techniques and procedures: (1) Plans sequence of operations: Analyzes condition of cutting tool and blueprints to determine sequence of operations and the type of machine and grinding wheel to be used. (2) Sets up and operates machine: Selects abrasive wheel and mounts it on machine, using wrench. Selects and installs holding fixtures or tooling. Sets and adjusts machine speed, feed, and depth of cut to grind tool to specified dimensions, applying knowledge of shop mathematics and trigonometry. Starts machine. Grinds and sharpens such items as staggered-tooth milling cutters, broaches, profile cutters, sprocket cutters, circular form tools, shank angular mills, solid gang cutters, helical and spiral cutters, worm thread milling cutters, hollow mills, and tapered reamers. Measures finished cutting tools to assure conformance to standards, using precision measuring instruments, such as micrometers, dial indicators, and surface gages. Works to tolerances of ± .0001 inch.

D.O.T. Conversion: TOOL GRINDER OPERATOR (mach. shop) 603.280

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			No additional training or short demonstration only
GRINDER OPERATOR, EXTERNAL, TOOL	(mach. shop)	603.280	None
GRINDER OPERATOR, INTERNAL, TOOL	(mach. shop)	603.280	None
GRINDER OPERATOR, SURFACE, TOOL	(mach. shop)	603.280	None
GRINDER OPERATOR, TOOL	(mach. shop)	603.280	None

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			No additional training or short demonstration only
GRINDER OPERATOR, UNIVERSAL, TOOL	(mach. shop)	603.280	None
GRINDER SET-UP OPERATOR, JIG	(mach. shop)	603.280	None
GRINDER SET-UP OPERATOR, THREAD TOOL	(mach. shop)	603.280	None
TOOL-GRINDER OPERATOR (D.O.T. Conversion)			
Broach Grinder	(mach. shop)	603.280	None
Drill Sharpener	(mach. shop)	603.280	None
Hob Grinder	(mach. shop)	603.280	None
GRINDER SET-UP MAN	(mach. shop)	603.380	None

Defense Job Title: INSPECTOR, EXPERIMENTAL*

Inspects experimental sheet metal missile parts; machined, welded, or heat treated parts; and major and final assemblies to verify their dimensions and to assure conformance to

INSPECTOR, EXPERIMENTAL* (Continued)

blueprint specifications and inspection standards, applying knowledge of experimental production methods, finish specifications, experimental inspection policies, and advanced shop mathematics, and using precision measuring and inspection instruments and tools, such as transits, levels, surface plates, and gages: (1) Examines part or assembly: Examines part or assembly to determine compliance with specifications, using precision measuring instruments. Stamps approved or rejected items to indicate conformance with or deviation from acceptable inspection standards. Indicates rework required to bring substandard part into conformance with specifications. Prepares document to indicate disposition of unacceptable items. (2) Makes recommendations: Contacts company planning, engineering, tooling and supervisory personnel to recommend changes in design or fabrication and installation procedures. (3) Compiles report: Prepares report of experimental installations to indicate reasons for defective components and assemblies.

D.O.T. Conversion: INSPECTOR, EXPERIMENTAL (aircraft mfg.) 806.381

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			No additional training or short demonstration only
INSPECTOR, ASSEMBLIES AND INSTALLATIONS	(aircraft mfg.)	806.381	None
Engine-Installation Inspector	(aircraft mfg.)	806.381	None
Inspector, Final Assembly	(aircraft mfg.)	806.381	None
Inspector, Subassembly	(aircraft mfg.)	806.381	None

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			No additional training or short demonstration only
MAJOR-ASSEMBLY INSPECTOR	(aircraft mfg.)	806.381	None
TESTER, PLUMBING SYSTEMS	(aircraft mfg.)	806.381	None
Fuel-System Tester	(aircraft mfg.)	806.381	None
Oxygen-System Tester	(aircraft mfg.)	806.381	None
			Anything beyond short demonstration up to and including 30 days
OUTSIDE-PRODUCTION INSPECTOR	(aircraft mfg.)	806.381	Thirty days to learn use of hardness tester.
FINAL INSPECTOR, TRUCK TRAILER	(auto. mfg.)	806.381	Thirty days to learn wiring color coding system.
			Over 30 days up to and including 3 months
DYNAMOMETER TESTER, MOTOR	(auto. mfg.)	806.281	Two months to three months to learn use of dynamometer.
Dynamometer Tester, Chassis	(auto. mfg.)	806.281	" "

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			Over 30 days up to and including 3 months
INTERNAL-COMBUSTION-ENGINE INSPECTOR	(engine & turbine)	806.281	Thirty days to two months to learn inspection specifications of internal-combustion engine.
Diesel-Engine Inspector	(engine & turbine)	806.281	" "
Gasoline-Engine Inspector	(engine & turbine)	806.281	" "
CAR CHECKER	(ret. tr.)	806.281	Thirty days to 2 months to learn automobile get-ready techniques and procedures.
NEW-CAR GET-READY MAN	(auto. ser.)	806.381	Thirty days to two months to learn automobile get-ready techniques and procedures.

Defense Job Title: INSPECTOR, GAGE*

Inspects linear working and gage laboratory equipment, such as hardness testers, torque wrenches, and plug gages to assure conformance to established company standards:

INSPECTOR, GAGE* (Continued)

(1) Examines instrument: Examines laboratory equipment or gage for wear or adjustment to determine repair techniques and methods. Measures instrument or gage to determine deviation from company standards, using precision measuring instruments, such as calipers, micrometers, and master gages. (2) Repairs, adjusts, and calibrates instruments: Repairs, adjusts, and calibrates linear working and gage laboratory equipment, applying knowledge of gage adjustment and repair. Replaces worn or damaged parts, using mechanics' handtools. Sets up and operates lapping machine to remove pitted surfaces from instruments and gages. Stamps instrument or gage inspected to indicate nature of work completed. (3) Completes written reports: Prepares written report to record action taken. Analyzes reports to determine cause of damage to measuring instruments and gages through improper use. Contacts supervisory personnel to inform them of improper use by production workers.

D.O.T. Conversion: INSPECTOR, GAGE (mach. shop.) 601.281

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			No additional training or short demonstration only
INSPECTOR, ROUGH CASTINGS	(found.)	600.281	None
			Anything beyond short demonstration up to and including 30 days
GAGE CONTROLLER	(clock & watch)	601.281	Thirty days to learn use of precision test instruments.

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			Anything beyond short demonstration up to and including 30 days
INSPECTOR, TOOL	(mach. shop)	601.281	Thirty days to learn use of hardness tester.
			Over 30 days up to and including 3 months
INSPECTOR, SET-UP AND LAY-OUT MAN	(mach. shop)	601.281	Two months to learn layout procedures and use of profilameter and hardness tester.

Defense Job Title: INSPECTOR, MAGNETIC PENETRANT

Inspects missile engine parts, assemblies, and raw stock to detect surface cracks, imperfect weldments, and other surface discontinuities, using magnetic particle and fluorescent penetrant equipment: Sets up and operates magnetic particle and fluorescent penetrant equipment to detect surface defects and cracks in missile engine parts. Visually examines iron oxide patterns and fluorescent penetrant traces to determine extent and nature of defect, applying knowledge of magnetic penetrant techniques. Stamps

INSPECTOR, MAGNETIC PENETRANT (Continued)

or attaches inspection tag to part to indicate conformance with specifications. Prepares written report to indicate inspection made.

D.O.T. Conversion: INSPECTOR, MAGNETIC (mach. shop) 609.382

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			Over 3 months up to and including 6 months
FLUOROSCOPE OPERATOR	(aircraft mfg.; nonfer. metal alloys)	502.382	Three months to four months to learn use of fluoroscope.

Defense Job Title: INSPECTOR, RECEIVING

Inspects raw materials, partly processed or finished parts, and accessories and assemblies received from suppliers to determine that workmanship, dimensions, and materials conform to specifications, applying knowledge of receiving procedure and documentation and government regulations, and using precision measuring instruments: (1) Reviews data: Reviews blueprints, specifications, engineering data, and procurement data sheets to ascertain standards for items inspected. (2) Inspects parts: Inspects materials, parts, accessories, and assemblies received from vendors to

INSPECTOR, RECEIVING (Continued)

ascertain workmanship, dimensions, and quality of materials, using precision measuring instruments, such as hardness tester, micrometers, calipers, and gages. Stamps acceptable items. Prepares documentation to dispose of unacceptable items.

D.O.T. Conversion: PROCUREMENT INSPECTOR (aircraft mfg.) 806.384

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			No additional training or short demonstration only
SALVAGE INSPECTOR	(aircraft mfg.; motor. & bicycles)	806.387	None
INSPECTOR, RETURNED MATERIALS	(auto. mfg.)	806.387	None
WHEEL INSPECTOR	(r. r. trans.)	806.387	None
			Over 30 days up to and including 3 months
INSPECTOR, AIRCRAFT LAUNCHING AND ARRESTING SYSTEMS	(gov. ser.)	806.384	Three months to apply receiving inspection skills to safety and function inspection techniques.

Defense Job Title: INSPECTOR, TOOLING*

Inspects tooling, such as jigs, fixtures, dies, and templates used in the manufacture of missiles and missile engines to assure conformance with blueprint specifications, shop practices, and inspection standards, applying knowledge of tool inspection standards and techniques: (1) Plans inspection procedure: Analyzes tooling and production information, such as loft information, operations sheets, and manufacturing plans to determine sequence of operations and type of inspection instruments to be used. (2) Sets up and inspects tooling: Sets up tooling on surface plate, angle plate, or sine plate to verify dimensions, hole locations, and parallelism of tooling. Measures tooling to assure conformance to specifications applying knowledge of missile parts fabrication, assembly and installation, and using precision measuring instruments, such as micrometers, calipers, and gages. (3) Prepares repair orders: Prepares repair orders for defective tooling to conform to shop practices and tool making methods and routes them to specified department for rework. (4) Prepares records: Prepares written record of new or reworked tools and notes any deviations from engineering or tooling design.

D.O.T. Conversion: INSPECTOR, TOOL (mach. shop) 601.281

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			No additional training or short demonstration only
INSPECTOR, FLOOR	(mach. shop)	609.381	None

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			Anything beyond short demonstration up to and including 30 days
INSPECTOR, ROUGH CASTINGS	(found.)	600.281	Thirty days to learn layout procedures.
GAGE CONTROLLER	(clock & watch)	601.281	Thirty days to learn use of precision test instruments.
INSPECTOR, GAGE	(mach. shop)	601.281	Thirty days to learn lapping operations.
			Over 30 days up to and including 3 months
INSPECTOR, SET-UP AND LAY-OUT MAN	(mach. shop)	601.281	Thirty days to two months to learn gaging set up and layout procedures.

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Defense Job Title: INSPECTOR, WELDED PARTS*

Inspects welded and brazed missile parts and assemblies to assure conformance to blueprint specifications or engineering data, applying knowledge of a variety of welding and brazing methods and physical characteristics of metals: (1) Inspects missile parts:

INSPECTOR, WELDED PARTS* (Continued)

Inspects metal missile parts for such factors as dimensions, processing, workmanship, soundness of welds, materials, hardness, straightness, alinement, and machinability to assure conformance with specifications, using precision measuring instruments, such as micrometers, calipers, and gages. Stamps acceptable items to indicate compliance with standards. (2) Tests welds: Conducts such tests as sectional tests, hardness tests, proof loading tests, and destructive tests to insure conformance to physical standards, applying knowledge of testing procedures. (3) Records action taken: Prepares written report to indicate inspections made and tests performed.

D.O.T. Conversion: WELD INSPECTOR (welding) 819.381

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			No additional training or short demonstration only
WELDABILITY-TEST INSPECTOR	(welding)	819.381	None
			Over 30 days up to and including 3 months
INSPECTOR, ASSEMBLIES AND INSTALLATIONS	(aircraft mfg.)	806.381	Two months to learn use of precision measuring instruments.
Engine-Installation Inspector	(aircraft mfg.)	806.381	" "
Inspector, Experimental	(aircraft mfg.)	806.381	" "
Inspector, Final Assembly	(aircraft mfg.)	806.381	" "

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			Over 30 days up to and including 3 months
Inspector, Subassembly	(aircraft mfg.)	806.381	Two months to learn use of precision measuring instruments.
OUTSIDE-PRODUCTION INSPECTOR	(aircraft mfg.)	806.381	Two months to learn use of hardness tester and precision measuring instruments.
INSPECTOR, FABRICATION	(aircraft mfg.)	807.381	Two months to learn use of precision measuring instruments.
Inspector, Hammers and Presses	(aircraft mfg.)	807.381	" "
Trim and Cover Inspector	(aircraft mfg.)	807.381	" "
Welded Parts Inspector	(aircraft mfg.)	807.381	" "
			Over 3 months up to and including 6 months
FINAL INSPECTOR, TRUCK TRAILER	(auto. mfg.)	806.381	Three months to four months to learn electrical diagrams, color codes, and precision measuring instruments.

Defense Job Title: MACHINE TOOL REPAIRMAN "A"*

Rebuilds, repairs, and maintains precision built fabricating machines and machine tools, such as lathes, presses, hammers, milling machines, boring machines, screw machines, planers, and grinders, applying knowledge of construction and operation characteristics of machine tools and fabricating machines, and using mechanics' handtools: (1) Plans procedures: Inspects machines to detect broken or worn parts or listens to sounds of machines and equipment to locate malfunction, applying knowledge of equipment, blueprints, specifications and manufacturer's sketches. Dismantles machine to remove defective part, using handtools. (2) Lays out part: Measures and marks dimensions of part on raw metal stock or prepares sketch according to blueprint specifications for fabrication by machine shop personnel, using layout tools, and applying knowledge of trigonometry. (3) Re-assembles machine: Reassembles machine tool replacing or adjusting malfunctioning part, using mechanics' handtools, such as scrapers, wrenches and pliers. (4) Operates machine: Operates repaired machine to assure proper functioning. Adjusts machine to conform with manufacturers operations standards.

D.O.T. Conversion: MACHINE REPAIRMAN, MAINTENANCE (any ind.) 626.281

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			No additional training or short demonstration only
MACHINE REPAIRMAN, MAINTENANCE	(D.O.T. Conversion)		
Broaching-Machine Man	(mach. tool & access.)	626.281	None
Cannelure-Turning-Machine Adjuster	(ammunition)	626.281	None

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			No additional training or short demonstration only
Centerless-Grinding-Machine Adjuster	(ammunition)	626.281	None
Screw-Machine Adjuster, Automatic	(ammunition)	626.281	None
Screw-Machine Repairman	(mach. shop)	626.281	None
SEAMER MECHANIC	(any ind.)	626.281	None
REFORM MAN	(can. & preserv.)	626.281	None
FORGE-SHOP-MACHINE REPAIRMAN	(forging)	626.281	None
Load-Chain-Welding-Machine Repairman	(forging)	626.281	None
HYDRAULIC-PRESS SERVICEMAN	(ammunition)	626.381	None
REPAIRMAN, WELDING EQUIPMENT	(welding)	626.381	None
			Anything beyond short demonstration up to and including 30 days
GAS-WELDING-EQUIPMENT MECHANIC	(any ind.)	626.381	Thirty days to become familiar with welding equipment.

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			Over 30 days up to and including 3 months
REPAIRMAN, WELDING, BRAZING-AND-BURNING MACHINES	(welding)	626.381	Three months to learn soldering and wiring techniques.
Repairman, Resistance Welding Machines	(welding)	626.381	" "

Defense Job Title: MACHINIST, BENCH

Assembles missile parts, according to assembly blueprint specifications, using mechanics' handtools and power tools, such as drill presses and power grinders: (1) Lays out work: Measures and marks hole locations on metal missile parts or raw stock, according to blueprint specifications, using layout tools, such as scriber, dividers, and protractor. (2) Sets up and operates machines: Sets up and operates power grinder to remove rough edges and surfaces from castings, extrusions, and forgings. Sets up and operates drill press to drill, ream, tap spotface, and countersink holes in missile parts: (3) Assembles parts: Assembles missile parts according to assembly blueprint specifications, applying knowledge of assembly techniques, and using mechanics' handtools. Inspects assemblies to assure conformance to blueprint specifications, using precision measuring instruments, such as micrometers, calipers, and gages.

D.O.T. Conversion: PRECISION ASSEMBLER, BENCH (aircraft mfg.) 706.781

MACHINIST, BENCH (Continued)

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			No additional training or short demonstration only
ASSEMBLER	(mach. mfg.)	706.781	None
Crusher Assembler	(mach. mfg.)	706.781	None
Vibrator Assembler	(mach. mfg.)	706.781	None
			Anything beyond short demonstration up to and including 30 days
INTERNAL-COMBUSTION ENGINE SUBASSEMBLER	(engine & turbine)	706.781	Thirty days to learn use of power arbor press.
Carburetor Assembler	(engine & turbine)	706.781	" "
Cylinder-Head Assembler	(engine & turbine)	706.781	" "
Gearcase Assembler	(engine & turbine)	706.781	" "
Governor Assembler	(engine & turbine)	706.781	" "
Remote-Control Assembler	(engine & turbine)	706.781	" "
Water-Pump Assembler	(engine & turbine)	706.781	" "

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			Over 30 days up to and including 3 months
MODEL BUILDER	(furn.)	709.781	Three months to learn to use lathe and power saw and become familiar with furniture assembly.

Defense Job Title: MACHINIST, GENERAL*

Sets up and operates a variety of machine tools, such as milling machine, engine lathe, grinder, shaper, and boring machine to machine missile parts: (1) Lays out work: Analyzes blueprints to determine sequence of operations and use of part to be machined. Measures and marks lines of reference on raw metal stock, such as castings, forgings, tubing, bar stock, and extrusions, using layout tools, such as scriber, divider and compass. (2) Sets up and operates machines: Sets up and operates such machines as lathes, mills, shapers, drill presses, radial drills, and grinders to machine parts, according to blueprint specifications, and applying knowledge of machining operations. (3) Inspects parts: Inspects machined parts to assure conformance to blueprint specifications, using precision measuring instruments, such as micrometers, calipers and gages.

D.O.T. Conversion: MACHINIST I (mach. shop) 600.280

MACHINIST, GENERAL* (Continued)

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			No additional training or short demonstration only
ENGINE-LATHE SET-UP OPERATOR, TOOL	(mach. shop)	604.280	None
Lathe Set-Up Operator, Tool	(mach. shop)	604.280	None
TURRET-LATHE SET-UP OPERATOR, TOOL	(mach. shop)	604.280	None
Chucking-Machine Set-Up Operator, Tool	(mach. shop)	604.280	None
Screw-Machine Set-Up Operator, Tool	(mach. shop)	604.280	None
Turret-Lathe Set-Up Operator, Tool, Vertical	(mach. shop)	604.280	None
			Anything beyond short demonstration up to and including 30 days
MODEL MAKER	(firearms)	600.280	Thirty days to learn firearms application of machine skills.

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			Anything beyond short demonstration up to and including 30 days
PATTERNMAKER, METAL	(found.)	600.280	Thirty days to become familiar with foundry machining requirements.
MACHINIST, AUTOMOTIVE	(mach. shop)	600.280	Thirty days to become familiar with automotive parts.
MACHINIST, EXPERIMENTAL	(mach. shop)	600.280	Short demonstration to 30 days to learn experimental machining techniques.
PROFILING-MACHINE SET-UP OPERATOR, TOOL	(mach. shop)	605.280	Thirty days to learn profiling operations.
			Over 30 days up to and including 3 months
MAINTENANCE MACHINIST	(any ind.)	600.280	Thirty days to two months to learn machine repair diagnostic techniques.
Machinist, Construction Equipment	(any ind.)	600.280	" "
BORING-MACHINE SET-UP OPERATOR, JIG	(mach. shop)	606.280	Two months to three months to learn jig-boring operations.

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			Over 30 days up to and including 3 months
BORING-MILL SET-UP OPERATOR, HORIZONTAL	(mach. shop)	606.280	Two months to three months to learn boring mill operations.
			Over 3 months up to and including 6 months
INSTRUMENT MAKER II	(any ind.)	600.280	Three months to four months to learn to use a variety of metal stock and learn welding, brazing, and heat treating operations.
INSTRUMENT BUILDER	(inst. & app.)	600.280	Three months to four months to learn use of soldering, calibration, and electronic test equipment.

Defense Job Title: MACHINIST, HORIZONTAL BORING MILL

Sets up and operates horizontal boring mills to bore, drill, mill, face, and ream, holes in missile parts: (1) Lays out work: Analyzes detail blueprints and sketches to determine sequence of operations and dimension and tolerance requirements. Lays out lines of

MACHINIST, HORIZONTAL BORING MILL (Continued)

reference, and center points on parts, using layout tools. (2) Sets up and operates mill: Mounts workpiece on machine bed, using wrench. Selects cutting tool and mounts and adjusts it on spindle of machine, using wrench. Sets machine speed and feed rate, applying knowledge of machinability of metals. Starts machine and bores, mills, reams, or aps holes in missile part to exacting tolerances. (3) Inspects part: Inspects fin shed part to insure conformance to blueprint specifications, using precision measuring instruments, such as calipers, gages, and micrometers.

D.O.T. Conversion: BORING-MILL SET-UP OPERATOR, HORIZONTAL (mach. shop) 606.280

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			Anything beyond short demonstration up to and including 30 days
PROFILING-MACHINE SET-UP OPERATOR, TOOL	(mach. shop)	605.280	Thirty days to become familiar with profiling machine.
BORING-MACHINE SET-UP OPERATOR, JIG	(mach. shop)	606.280	Thirty days to become familiar with boring machine.

Defense Job Title: MAINTENANCE WORKER

Assists maintenance craftsmen in maintaining and repairing machinery plumbing, physical

MAINTENANCE WORKER (Continued)

structures, and electrical wiring of industrial plant: Assists maintenance craftsmen by performing such typical duties as erecting scaffolding and rigging, holding ladders, bending conduit, and cleaning up worksite. Cuts and threads pipes, using pipe threading equipment. Dismantles machines and equipment, using handtools. Digs trenches, ditches, and excavations; moves machinery and equipment; carries or transports materials; prepares surfaces for painting; drills and breaks up concrete; and performs miscellaneous manual operations as directed by maintenance craftsmen.

D.O.T. Conversion: MAINTENANCE-MAN HELPER, FACTORY OR MILL (any ind.) 899.884

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			No additional training or short demonstration only
ELECTRICIAN HELPER	(any ind.)	829.884	None
CABLE PULLER	(const.; light, heat, & power; tel.& tel.)	829.884	None
CARPENTER HELPER, MAINTENANCE	(const.)	860.887	None
FORM-BUILDER HELPER	(const.)	860.887	None
PIPE-FITTER HELPER	(const.)	862.884	None
Steam-Fitter Helper	(const.)	862.884	None

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			No additional training or short demonstration only
FLOOR-SANDER HELPER	(const.)	864.884	None
FLOOR-FINISHER HELPER	(const.)	864.887	None
FLOOR-LAYER HELPER	(const.)	864.887	None
Linoleum-Layer Helper	(const.)	864.887	None
FORM STRIPPER	(conc. prod.; const.)	869.887	None
MAINTENANCE-MAN HELPER, BUILDING	(any ind.)	899.887	None

Defense Job Title: MASTER LAYOUT MAN

Plans, lays out, develops, and fabricates original master layouts of major assemblies on glass cloth to be used in making production templates: (1) Plans work: Analyzes manufacturing plans, detailed tool orders, engineering blueprints, tool design drawings, and related data to develop such data as hole callouts, locating points, parts coordination, and operational assembly sequence to be used in fabrication of project tools and

MASTER LAYOUT MAN (Continued)

building major assemblies, such as structure beams, wing ribs, and firewall assemblies. (2) Fabricates layouts: Develops dimensions, contours, and reference lines and points, following multiple and diversified references, such as loft, engineering, planning, and design documents, in order to fabricate original master layouts on glass cloth. Recommends planning and design changes to facilitate the manufacture of tools or assemblies. Interprets data on glass cloth master layouts, such as engineering or tooling information, applying knowledge of layout procedures.

D.O.T. Conversion: TEMPLATE MAKER (any ind.) 601.381

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			No additional training or short demonstration only
TEMPLATE MAKER	(D.O.T. Conversion)		
Template Maker, Aircraft	(aircraft mfg.)	601.381	None
Template Maker, Sheet Metal	(any ind.)	601.381	None
Template Maker, Shipbuilding	(ship & boat bldg. & rep.)	601.381	None
BOILERMAKER, LOFTSMAN	(boilermaking; ship & boat bldg. & rep.)	601.381	None

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			Anything beyond short demonstration up to and including 30 days
PLASTIC TOOL MAKER	(mach. shop)	601.381	Become familiar with plastics.
PLASTIC-FIXTURE BUILDER	(mach. tool & access.)	601.381	Learn plastic casting procedures.
			Over 30 days up to and including 3 months
DIE FINISHER	(mach. shop)	601.381	Learn die finishing techniques.
DIE POLISHER	(wire)	601.381	Learn lapping methods and techniques.
			Over 3 months up to and including 6 months
DIE MAKER, BENCH STAMPING	(mach. shop)	601.281	Become familiar with die making procedures.
DIE MAKER, FOUR-SLIDE MACHINE	(mach. shop)	601.281	Become familiar with four-slide machine die-making procedures.
DIE SINKER, BENCH	(mach. shop)	601.281	Become familiar with die sinking operations and procedures.
PROGRESSIVE DIE MAKER	(mach. shop)	601.281	Become familiar with progressive dies.

Defense Job Title: OILER MAINTENANCE*

Lubricates machines and mechanical equipment according to manufacturers' specifications, using manual oiling or greasing devices: (1) Selects lubricant: Reviews manufacturers' lubrication specifications to ascertain type and amount of lubricant used. (2) Lubricates machine: Applies lubricant to specified points on machines or equipment according to routine schedule, using grease guns and oil cans. Fills oil reservoirs according to manufacturers' specifications. Removes packing lubricant from new machines and replaces it with operating lubricant. (3) Cleans equipment: Wipes excessive oil, grease, and blowby from machinery and equipment, using rags. Replaces grease cups, and broken or lost fittings, using screwdriver or wrench. Keeps lubricating record of machines and equipment worked on.

D.O.T. Conversion: OILER I (any ind.) 699.887

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			No additional training or short demonstration only
MACHINE CLEANER	(any ind.)	699.887	None
Bottle-Packing-Machine Cleaner	(any ind.)	699.887	None
Card Cleaner	(textile)	699.887	None
Creel Cleaner	(textile)	699.887	None
Guide-Rail Cleaner	(textile)	699.887	None
Loom Blower	(textile)	699.887	None
Opening-Machine Cleaner	(textile)	699.887	None
Pin Cleaner	(textile)	699.887	None
Rack Cleaner	(textile)	699.887	None
Shafting Cleaner	(any ind.)	699.887	None

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			No additional training or short demonstration only
HARNESS CLEANER	(textile)	699.887	None
ROPE CLEANER	(textile)	699.887	None

Defense Job Title: PAINTER, MAINTENANCE*

Paints factory and office buildings, rolling stock, and furniture, using brushes or spray painting equipment: (1) Prepares work: Reviews area or item to be painted to estimate amount, type, and method of applying paint, need for scaffolding, and materials needed, applying knowledge of trade practices. (2) Paints structure or item: Mixes, blends, and matches paint to proper color, applying knowledge of color blending procedures. Applies paint to surfaces, using brush or compressed air spray equipment. Rubs finish on office furniture to develop desired finish. (3) Cleans equipment: Removes excessive paint from brushes and spray painting equipment, using paint thinner and rags.

D.O.T. Conversion: PAINTER, MAINTENANCE (any ind.) 840.781

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			No additional training or short demonstration only
PAINTER	(const.)	840.781	None
Calciminer	(const.)	840.781	None
Painter, Interior Finish	(const.)	840.781	None
Varnisher	(const.)	840.781	None
PAINTER, SHIPYARD	(ship & boat bldg. & rep.)	840.781	None

D efense Job Title: PLANETARY CABLE STRANDING MACHINE OPERATOR

Operates planetary cable stranding machine to fabricate various types of electronic control cables and harnesses: (1) Plans work: Reviews engineering blueprints, shop and work orders, sketches, and oral and written instructions to ascertain the types, sizes, numbers, and lengths of wires required to produce the desired configuration of cable. (2) Loads machine: Operates spool-winding machine to transfer wire, filler, and tape in specified lengths onto spools. Installs spools on cable stranding machine, using hand-tools. Starts machine. Adjusts speed and feed settings on machine and receiving spool to obtain correct tensions, and qualities in finished product.

PLANETARY CABLE STRANDING MACHINE OPERATOR (Continued)

D.O.T. Conversion: STRANDING MACHINE OPERATOR (elec. equip.; insul. wire; wireworks) 616.782

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			No additional training or short demonstration only
SPADE-WINDING-MACHINE ADJUSTER	(electronics)	616.780	Short demonstration.
FENCE-MAKING-MACHINE OPERATOR	(wirework)	616.782	Short demonstration to become familiar with machine.
STRANDING-MACHINE OPERATOR (D.O.T. Conversion)			
Closer	(wirework)	616.782	None
Strand Buncher, Fine Wire	(wirework)	616.782	None
			Anything beyond short demonstration up to and including 30 days
SHOTGUN-SHELL-ASSEMBLY-MACHINE ADJUSTER	(ammunition)	616.780	Thirty days to become familiar with machine.
BODY-MAKER-MAINTENANCE MAN	(tinware)	616.780	Thirty days to become familiar with machine.

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			Anything beyond short demonstration up to and including 30 days
CAGE MAKER, MACHINE	(conc. prod.)	616.782	Short demonstration to thirty days to learn tack welding.
NAIL-ASSEMBLY-MACHINE OPERATOR	(nail)	616.782	Thirty days to familiarize with machine and learn to use staple gun.
BALE-TIE-MACHINE OPERATOR	(wirework)	616.782	Short demonstration to thirty days to become familiar with machine.
BARBED-WIRE-MACHINE OPERATOR	(wirework)	616.782	Short demonstration to thirty days to become familiar with machine and to learn butt welding.
			Over 30 days up to and including 3 months
TRIM-MACHINE ADJUSTER	(ammunition)	616.780	Two months to three months to learn use of grinder and speed lathe.
NAIL-MAKING-MACHINE SET-UP MAN	(nail)	616.780	Two months to three months to learn use of precision measuring instruments and inspection techniques.

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			Over 30 days up to and including 3 months
CRIMPING-MACHINE OPERATOR	(any ind.)	616.782	Two months to three months to learn use of precision measuring instruments.
Zig-Zag-Spring-Machine Operator	(wirework)	616.782	" "
KICK-PRESS OPERATOR I	(any ind.)	616.782	Two months to three months to learn use of precision measuring instruments.
SAFETY-PIN-ASSEMBLING-MACHINE OPERATOR	(needle, pin, & rel. prod.)	616.782	Two months to three months to learn use of precision measuring instruments.
WIRE WEAVER, CLOTH	(wirework)	616.782	Two months to three months to learn use of power lift and precision measuring instruments.

Defense Job Title: PLUMBER, MAINTENANCE "A"*

Installs, maintains, and repairs plumbing on sanitary, hydraulic, water, and pneumatic systems, fittings, accessories, and fixtures, using plumbers' handtools: (1) Locates plumbing leak or break: Reviews plant blueprints, sketches, and drawings indicating layout and location of plumbing lines, fixture, accessories, and equipment to ascertain possible location of leak or break in pluming system. Looks for such clues as rust, liquid accumulation, and drop in pressure gage indicators to isolate leak. Marks affected points on walls, floors, and ceilings as guide for other workers. (2) Repairs plumbing: Examines condition of piping to ascertain nature and extent of damage, type and amount of replacement parts, type of service to be discontinued, and duration of repair. Turns valve to stop flow of liquid or gas. Disconnects affected pipes or accessories, using plumbers' handtools. Threads pipes, using pipe threading equipment. Installs pipes and accessories, applying knowledge of local codes and underwriters' standards, and using wrenches. Turns valves to allow flow of liquids and gases through respective systems. (3) Inspects work: Verifies readings on pressure and flow gages to assure proper functioning of systems.

D.O.T. Conversion: PLUMBER, MAINTENANCE (any ind.) 862.381

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			No additional training or short demonstration only
PIPE FITTER, MAINTENANCE	(any ind.)	862.381	None
INSTRUMENT FITTER	(const.)	862.381	None

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			No additional training or short demonstration only
MAINTENANCE MAN, SEWER-AND-WATERWORKS	(const.)	862.381	None
Maintenance Man, Sewer	(const.)	862.381	None
Maintenance Man, Waterworks	(const.)	862.381	None
PIPE FITTER I	(const.)	862.381	None
Pipe Fitter, Ammonia	(const.)	862.381	None
Pipe Fitter, Gas Pipe	(const.)	862.381	None
Pipe Fitter, Plastic Pipe	(const.)	862.381	None
Pipe Fitter, Soft Copper	(const.)	862.381	None
Steam Fitter	(const.)	862.381	None
PIPE FITTER, SPRINKLING SYSTEMS	(const.)	862.381	None
PLUMBER	(const.)	862.381	None
GAS-MAIN FITTER	(light, heat, & power)	862.381	None
Pipe Fitter, Street Service	(light, heat, & power)	862.381	None
INDUSTRIAL-GAS FITTER	(light, heat, & power)	862.381	None

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			No additional training or short demonstration only
STEAM SERVICEMAN	(light, heat, & power)	862.381	None
FREIGHT-AIR-BRAKE FITTER	(loco. & car bldg. & rep.)	862.381	None
AIRDOX MAN	(mining & quarrying)	862.381	None
			Anything beyond short demonstration up to and including 30 days
PIPE FITTER, DIESEL ENGINE	(engine & turbine)	862.381	Thirty days to learn brazing.
PIPE FITTER, TURBINE	(engine & turbine)	862.381	Thirty days to learn brazing.
FURNACEMAN	(light, heat, & power)	862.381	Thirty days to learn electrical codes and bricklaying techniques.
			Over 30 days up to and including 3 months
AIRCRAFT MECHANIC, PLUMBING AND HYDRALUIC	(aircraft mfg.)	862.381	Three months to learn fabricating machine operations.

Defense Job Title: PROFILE CUTTING TORCH OPERATOR

Operates single- or multiple-head profile cutting torch machine to cut metals used in the production of missile parts: (1) Installs template and workpiece: Reviews blueprints to ascertain type of torch tip and template to be used. Clamps template in place on tracing table, using wrench. Attaches torch tip and positions it over workpiece. Clamps metal workpiece on bed of machine, using wrench. (2) Traces template: Lights torch and turns handle to adjust size of flame. Turns knobs and reads gages to obtain selected gas and oxygen pressure and mixture and set speed of cutting action, applying knowledge of techniques involved in cutting metals by gas methods. Guides stylus over template manually or engages automatic tracing mechanism that guides torch over workpiece on bed or machine to cut it to specified dimensions.

D.O.T. Conversion: FLAME-CUTTING-MACHINE OPERATOR (welding) 816.782

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			No additional training or short demonstration only
FLAME-CUTTING-MACHINE OPERATOR	(D.O.T. CONVERSION)		
Oxygen-Lance Cutter	(welding)	816.782	None
FLAME-CUTTING TRACER-MACHINE OPERATOR	(welding)	816.782	None
Electronic-Eye Flame-Cutting-Machine Operator	(welding)	816.782	None
Magnetic Flame-Cutting-Machine Operator	(welding)	816.782	None
Track-Template Flame Cutting Machine Operator	(welding)	816.782	None

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			Over 30 days up to and including 3 months
BRAZER, RESISTANCE I	(welding)	810.782	Two months to become familiar with resistance machine procedures.
WELDER, BUTT I	(welding)	810.782	Two months to become familiar with butt welding machine procedures.
WELDER, SEAM I	(welding)	810.782	Two months to become familiar with seam welding machines.
WELDER, SPOT I	(welding)	810.782	Two months to become familiar with spot welding machine.
Welder, Multiple Spot	(welding)	810.782	" "
WELDING-MACHINE OPERATOR, ARC	(welding)	810.782	Two months to become familiar with arc welding machine.
WELDING-MACHINE OPERATOR, GAS	(welding)	811.782	Two months to become familiar with gas welding machine procedures.
BRAZING-MACHINE OPERATOR I	(welding)	814.782	Two months to become familiar with brazing machine procedures.
Soldering-Machine Operator	(welding)	814.782	" "

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			Over 30 days up to and including 3 months
LEAD BURNER, MACHINE	(elec. equip.)	815.782	Two months to become familiar with lead burning process.
			Over 3 months up to and including 6 months
WELDING-MACHINE OPERATOR, GAS-SHIELDED ARC	(welding)	810.782	Four months to become familiar with inert gas welding procedures.
Tungsten-Welding-Machine Operator Inert Gas	(welding)	810.782	" "
WELDING-MACHINE OPERATOR, SUBMERGED ARC	(welding)	810.782	Four months to become familiar with submerged arc welding procedures.

Defense Job Title: SAW OPERATOR, GENERAL

Sets up and operates heavy duty Do-all bandsaw to cut metallic and non-metallic missile parts: (1) Sets up machine: Reviews detail assembly blueprint to ascertain sequence of operations, materials used, and dimensions and tolerances of final product. Selects and mounts blade on machine, using wrench. Turns knobs to adjust machine speed and feed, and blade tensions, table angle, stop blocks, and fixtures. (2) Mounts workpiece: Operates hoists or overhead cranes to mount heavy or bulky materials on machine bed, or roller top tables. Starts machine. Guides workpiece through saw blade or engages automatic feeding device. Measures finished workpiece to assure conformance to blueprint specifications, using protractors, squares, and calipers.

D.O.T. Conversion: DO-ALL-SAW OPERATOR (mach. shop) 607.782

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			No additional training or short demonstration only
SAW OPERATOR	(aircraft mfg.)	607.782	None
MAGNESIUM-MILL OPERATOR	(nonfer. metal alloys)	607.782	None
			Anything beyond short demonstration up to and including 30 days
CUT OFF SAW OPERATOR, METAL	(mach. shop)	607.782	Thirty days to become familiar with a variety of saws.

Defense Job Title: TURRET LATHE OPERATOR "A"

Sets up and operates turret lathe to machine metal parts used in the production of missiles: (1) Lays out work: Reviews blueprint specifications to ascertain sequence of operations, materials used, and tooling required. Lays out lines of reference and center points on workpiece, using layout tools. (2) Sets up machine: Mounts workpiece in holding fixture or chuck and cutting tools in turret, using wrench. Sets and adjusts machine speeds and feeds, applying knowledge of machinability of metals. (3) Operates machine: Starts machine. Engages automatic feed to cut workpiece to specified dimensions. Operates lathe to perform such typical operations as forming, turning, tapping, boring, grooving, and thread cutting of workpiece. (4) Inspects work: Inspects completed work to assure conformance with blueprint specifications, using precision measuring instruments or templates.

D.O.T. Conversion: TURRET-LATHE SET-UP OPERATOR (mach. shop) 604.380

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			No additional training or short demonstration only
CHUCKING-MACHINE SET-UP OPERATOR	(mach. shop)	604.380	None
CHUCKING-MACHINE SET-UP OPERATOR, MULTIPLE SPINDLE, VERTICAL	(mach. shop)	604.380	None
ENGINE-LATHE SET-UP OPERATOR	(mach. shop)	609.380	None
Tracing-Lathe Set-Up Operator	(mach. shop)	609.380	None

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			No additional training or short demonstration only
THREADING-MACHINE SET-UP MAN	(mach. shop)	609.380	None
			Over 3 months up to and including 6 months
CHUCKING-MACHINE SET-UP MAN	(mach. shop)	604.380	Three months to four months to improve set-up skills.
LATHE SET-UP MAN	(mach. shop)	604.380	Three months to four months to improve set-up skills.
TURRET-LATHE SET-UP MAN	(mach. shop)	604.380	Three months to four months to develop set-up skills.

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Defense Job Title: WELDOR, COMBINATION, PRECISION*

Welds missile parts and assemblies together, applying knowledge of welding techniques and using gas, inert gas-arc, and electric arc welding equipment: (1) Plans work: Reviews work order to determine techniques to be used in order to weld production, spare

WELDOR, COMBINATION, PRECISION* (Continued)

experimental, or developmental parts and assemblies. (2) Welds parts and assemblies: Positions parts or assemblies, prior to welding in order to insure accessiblity to areas on assemblies to be joined, considering strain and distortion factors. Welds parts or assemblies which are subject to high pressure or stress and are to be machined to exacting tolerances, applying knowledge of welding characteristics of metals and metal alloys and welding techniques, and using gas, inert gas-arc, or electric arc welding equipment. When welding parts in sealed chamber under controlled atmospheric conditions or under extreme temperatures, performs hand or machine fusion welding on parts requiring overhead, horizontal, vertical, and circular welding techniques. (3) Inspects parts: Examines welds to detect cracks, cold welds, and spatter.

D.O.T. Conversion: WELDER, COMBINATION (welding) 812.884

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			No additional training or short demonstration only
WELDER, ARC	(welding)	810.884	None
Welder-Burner	(welding)	810.884	None
WELDER, GUN	(welding)	810.884	None
WELDER, TACK	(welding)	810.884	None
WELDER, GAS	(welding)	811.884	None

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			No additional training or short demonstration only
WELDER, PRODUCTION LINE	(welding)	812.884	None
Brazer, Production Line	(welding)	812.884	None
Welder, Production Line, Arc	(welding)	812.884	None
Welder, Production Line, Combination	(welding)	812.884	None
Welder, Production Line, Gas	(welding)	812.884	None
WELDER, REPAIR	(welding)	812.884	None
Welder, Casting Repair	(found.)	812.884	None
Welder, Salvage	(welding)	812.884	None
			Anything beyond short demonstration up to and including 30 days
WELDER, ATOMIC	(welding)	810.884	Thirty days to learn atomic welding techniques.
WELDER, GAS-SHIELDED ARC	(welding)	810.884	Thirty days to become familiar with inert gas welding techniques.

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			Anything beyond short demonstration up to and including, 30 days
Tungsten Welder, Inert Gas	(welding)	810.884	Thirty days to become familiar with inert gas welding techniques.
Welder, Heliare	(welding)	810.884	" "
WELDER, HAND, SUBMERGED ARC	(welding)	810.884	Thirty days to learn submerged arc welding techniques.
BRAZER-ASSEMBLER	(welding)	814.884	Thirty days to learn brazing operations.
Brazer, Assembly Repair	(welding)	814.884	" "
Solderer, Torch	(welding)	814.884	" "
BRAZER, CRAWLER TORCH	(welding)	814.884	Thirty days to become familiar with crawler torch.
BRAZER, REPAIR AND SALVAGE	(welding)	814.884	Thirty days to become familiar with brazing operations.
Brazer, Test and Repair	(welding)	814.884	" "
SOLDERER-DIPPER	(welding)	814.884	Thirty days to learn soldering techniques.
SOLDERER, PRODUCTION LINE	(welding)	814.884	Thirty days to learn soldering techniques.

Counterpart Occupations D.O.T. Titles	D.O.T. Industrial Designation	D.O.T. Code	Minimum Retraining Requirements
			Over 30 days up to and including 3 months
BOILERMAKER WELDER	(welding)	810.884	Two months to become familiar with pressure vessels.

Technical Appendix C

DEFENSE OCCUPATIONS FOR WHICH NO RELATED COUNTERPART OCCUPATIONS HAVE BEEN FOUND

Of the 127 defense occupations included in the study, detailed job analysis schedules were prepared for 99 occupations. Out of these 99 occupations, there were six for which no counterpart occupations were identified as listed below:

1. IGNITER FABRICATOR
2. INSPECTOR, MOTOR PROCESS, SENIOR
3. MECHANIC, PLASTICS
4. OPERATOR, SOLID PROPELLANT
5. PLASTICS FABRICATOR, SENIOR
6. PROCESSOR, SOLID ROCKET MOTOR "A"

These occupations are described in alphabetical order on the following pages.

Defense Job Title: IGNITER FABRICATOR

D.O.T. Conversion: ASSEMBLER, IGNITER (ordnance) 737.381

Assembles and tests igniter units used to ignite solid propellant in rocket motors: (1) Blends materials for pyrotechnic charges: Weighs powdered chemicals on scale to obtain specified amounts and dumps chemicals into double coned blender. Adjusts control to regulate mixing time, according to specifications. (2) Sets up and operates mechanical rotary press: Weighs or measures specified chemical ingredients and dumps them in feeding device of rotary press. Turns handles to regulate feed mechanism and adjust position of rollers, following specifications. Measures distance between rollers with feeler gage to verify accuracy of set up. Starts machine to compress powdered pyrotechnic into pellets for trial run. Positions sample pellet on crush testing device and pushes lever to apply pressure to crush pellet. Reads dial measuring pounds of pressure to insure that pellet collapses at specified pressure. Starts rotary press machine to process pellets. Measures thickness of pellets to insure adherence to standards, using micrometer. (3) Assembles igniter parts: Reads specifications and sketches to ascertain procedures for assembling parts. Fits metal parts together using fixtures or clamps. Bolts and screws parts together using torque wrenches, power screwdrivers, and mechanics' handtools. Glues plastic parts together as specified. Measures parts to insure conformance to specified tolerance, using gages and micrometers. Brushes adhesive material on pyrotechnic pellets or slugs and positions them in igniter. When assembling igniter charged by powdered pyrotechnic material, fabricates wire baskets used to hold igniter charges, with handtools, and screws basket containing powdered material into igniter assembly. (4) Wires squibbs detonators used in igniting rocket fuel: Cuts colored wires to specified size, using cutters. Solders igniter wires to terminals on detonator and igniter package, following directions in wiring diagrams. Tests continuity of circuit using Linkometer millivolt potentiometer. (5) Tests rocket motor: Performs mechanical test on safety mechanism by activating cylinder on igniter cam and adjusting position of cam and microswitch that triggers firing mechanism, following specified procedures. Lifts rocket motor with overhead hoist and places it in hydraulic test fixture. Attaches pressure hoses to motor fuel system, using plumbing connections. Turns knob to open valve and regulate flow of nitrogen through motor. Guides leak detection device over surface of motor that measures presence of nitrogen on dial, indicating a leak, and informs prescribed personnel. Attaches identification tags, and fastens assembly unit in shipping tray, using strap wrench. Encloses and seals unit in plastic bag for storage or shipment.

Defense Job Title: INSPECTOR, MOTOR PROCESS, SENIOR

D.O.T. Conversion: PROCESS INSPECTOR (ordnance) 736.381

Inspects solid rocket motors, igniters, and propellants at various stages of fabrication and assembly for adherence to specified sequence of operation and for correctness of assembly, according to blueprints and military specifications: (1) Inspects hardware: Positions measuring instruments, such as height gages, inside micrometers, outside micrometers, straight edges, and calipers against nozzles, brackets, chambers, insulations, core assembly, igniter assembly and propellant grains, and reads scale to obtain dimension. Verifies accuracy of angles, using instruments, such as protractors, optical transits and tooling bars. Compares readings with specifications to ascertain whether component meets tolerance. Inspects parts for cleanliness and defects, such as cracks, nicks, paint blisters, and identification data. Observes processes and fabrication of parts to insure that specified procedures are followed by workers. (2) Performs non-destructive testing to detect flaws: Selects settings, such as wave length and frequency, on ultrasonic contact equipment, applying knowledge of testing procedures, and adjusts controls. Guides crystal, attached to transducer, around part being tested and observes wave pattern on graph or scope to detect sub-surface defects, such as cracks and voids. (3) Conducts alcohol wipe test to determine porosity of carbon parts: Brushes alcohol over surface of part. Positions part on holding device of air drier. Pushes button to start drier that blows warm air over surface of part to evaporate alcohol. Times period of evaporation, using stopwatch. Ascertains porosity of carbon parts based on rate of evaporation and knowledge of evaporation characteristics of acceptable parts. (4) Inspects harnesses and circuitry used in rocket control and igniter systems: Reads prints and sketches and examines harnesses to insure that wiring conforms with designated color code. Pulls components and wires to detect loose wires and connections. Connects power source and testing equipment, such as ammeters and ohmmeters, at specified points to measure electrical characteristics of system. Reads dials on instruments and compares readings with specifications to ascertain conformance to standards. (5) Inspects manufacturing processes by visual observation and by reviewing records kept by workers: Observes grinding, mixing, and blending of materials, such as rocket fuel, oxidizer, and insulation materials, to insure that workers follow specified procedures. Reads indicators on weight to verify proportions of ingredients to be mixed or blended. Reads control settings on mixing equipment and cure ovens to insure that equipment setup complies with specifications. Inspects activities related to the application of resin and insulation materials to insure that liquids are applied evenly and in specified quantity. Reviews records prepared by workers

INSPECTOR, MOTOR PROCESS, SENIOR (Continued)

describing various phases of processing and determines whether standards have been met, according to specifications and job knowledge. Directs the sampling of propellant, oxidizer, and insulation mixtures for laboratory analysis. Adjusts controls to regulate room temperature and humidity, according to specifications. (6) Prepares reports describing defects or malfunctions in various products for superior.

//

Defense Job Title: MECHANIC, PLASTICS

D.O.T. Conversion: None 806.782

Sets up and operates longitudinal and hoop filament winding machines to wind fiberglass filament (roving)around mandrel to form rocket chambers: (1) Applies plaster to mandrel to obtain prescribed form: Positions assembled aluminum mandrel on holding fixture. Reads work orders to determine amount and thickness of plaster to be applied to mandrel. Adjusts position of fixed template that shapes plaster, in relation to mandrel, and measures distance between mandrel and template with measuring device to insure that template sweeps (spreads) plaster to specified thickness. Informs workers of proportions of dry and liquid materials to be used for plaster, according to work order specifications or job knowledge. Starts motor that rotates mandrel and turns knob to adjust speed of revolutions. Applies plaster to mandrel, using hands. Lifts plastered mandrel into oven for curing, using hoist. Adjusts timing and temperature controls on oven, according to specifications or job knowledge. Removes mandrel from oven after specified period of time and applies finish coat of plaster, using handtools. Measures mandrel with calipers to verify dimensions. Pulls rubber insulation sleeve, fabricated in sections, over fore and aft insulator and center sections, using modified wrenches. (2) Sets up and operates longitudinal filament winding equipment to wind filament around plaster-covered mandrel: Mounts mandrel on bed of longitudinal winding machine, using bolts and wrenches. Positions

MECHANIC, PLASTICS (Continued)

spools of fiberglass filament impregnated with glue, on spindles mounted on winding arm. Threads filament over teflon-coated rollers of device thattwists filaments into a single strand. Turns dials that regulate speed of rotation of table and revolution of arm around mandrel. Starts equipment and observes filament laid down on plaster-covered mandrel to insure that filament is wound evenly. Reads counter to ascertain layers of filament wound. Directs workers in positioning of preformed plastic doilies over portholes to reinforce filament. Removes filament-wound mandrel from platform. (3) Sets up and operates hoop winding equipment to wind additional strands of filament around circumference of filament-wound mandrel to form chamber: Observes workers positioning chamber in holding fixture to insure that chamber is mounted according to specifications. Threads filament over rollers of hydraulically operated plate that goes up and down while mandrel turns on table to wrap filament around chamber. Turns knobs on control panel to regulate speed and coordinate movement of equipment. Observes the positioning of pre-cut strips of plastic at specified points, to form skirts. Reads counter to determine number of layers of filament applied to chamber. (4) Prepares chamber for curing: Places polyethylene bag over chamber, which has been wrapped in glasscloth and metal shell, using hoist. Inserts copper tubing and pressure gage hose through holes in bag. Applies putty around tubing to form seal. Directs workers in loading chamber in oven and connecting vacuum hoses to copper tubing. Starts vacuum pump to form vacuum inside bag and chamber. Adjusts temperature and timing controls to cure chamber in oven according to specifications. (5) Installs accessories on cured chamber after removal of mandrel and plaster: Brushes epoxy (adhesive) on pre-formed aluminum groundstrap and positions strap on chamber in specified locations for use in rocket control system. Installs metal bosses (plugs to which transducers are attached) on aft end of chamber by positioning bosses on chamber beneath depressions on fixture and pulling lever that lowers head of fixture to embed plugs in chamber under pressure.

//

Defense Job Title: OPERATOR, SOLID PROPELLANT

D.O.T. Conversion: PROCESSOR, SOLID PROPELLANT (explosives) 590.884

Performs a variety of duties related to the production of solid rocket propellants and motors, such as mixing and casting propellant, testing subassemblies, and applying lining on interior surfaces of rocket chambers. (1) Tends blending and grinding equipment: Confers with workers to insure that hoppers are filled with specified ingredients. Pushes buttons on remote control unit to start machine equipped with a series of oscillating screens that grinds ingredients. Turns off equipment at specified time when material has been ground to prescribed texture. (2) Tends blending equipment to combine ingredients for pre-mix: Weighs liquid and solid chemical ingredients on deck or gram scale. Pours specified amount of ingredients into blender and clamps lid. Starts blender that mixes ingredients together. Turns calibrated knob to activate timing device that turns off machine after specified interval. Positions propellant car (container mounted on wheels) under spigot of blending machine and opens valve to empty contents of mixer into container. (3) Tends remote controlled batch equipment, that mixes ingredients for solid rocket propellant: Confers with personnel to insure that hoppers of feed devices are filled with specified amounts of pre-mixed material, oxidizer, and catalyst. Pushes levers to open valves, allowing ingredients to move from hopper to mixer by gravity. Adjusts temperature controls according to specifications on work order. Pushes button to start equipment that mixes ingredients together. Observes indicators on panel to insure that temperature and flow of ingredients are within prescribed limits of safety. Turns off machine after specified period of time. Pushes lever to open valve releasing propellant from mixer into pipeline for further processing. (4) Tends equipment that lines chamber interior: Adjusts controls to regulate temperature and humidity of room in accordance with standards. Lifts chamber from carrier and positions it in probe spray unit, using overhead hoist. Starts equipment to lower revolving spray apparatus in chamber to coat interior surfaces with rubber base lining. Observes fineness of spray and speed of rotation of spray unit for conformance to standards and adjusts controls, as required. Transports chamber to cure oven, using overhead hoist. Removes chamber from hoist and positions it in cure oven. Sets oven controls to obtain specified temperature. Removes chamber from oven after specified period of time. (5) Paints exterior cork surface of missiles: Applies pre-mixed paint to missile chamber, using roller. Starts and stops conveyor equipment that carries chambers along production line. (6) Casts propellant in molds: Lifts propellant pots from conveyor, using overhead hoist. Removes sample of

OPERATOR, SOLID PROPELLANT (Continued)

propellant from pot using vacuum draw-off technique. Labels sample container according to batch and mixer number, for laboratory analysis. Empties contents of propellant pot into ports surrounding casting bell. Places chamber inside casting bell, using hoist. Positions core in centering fixture inside chamber. Connects lines of ports to casting bell, using quick clamp devices. Turns on vacuum draw equipment that causes propellant to flow from ports, through the casting bell, and into the chamber. Removes chamber from casting bell, using hoist. Cures propellant in curing oven. Pulls core from cured propellant using core pulling device attached to hoist. (7) Conducts pressure tests to locate leaks in assemblies and subassemblies: Connects hoses to cylinder of compressed gas and object to be tested, such as exhaust nozzle, gas generator, hose connections, or igniter. Attaches leak detection fixture to object with clamps. Turns handle to release nitrogen and freon gas into object to be tested at specified pressure. Observes pressure meter to detect loss of pressure indicating presence of leak. Weighs and mixes specified chemical ingredients for leak repairing substance. Brushes sealing compound on object to stop leak. Retests object for leak after specified length of time.

//

Defense Job Title: PLASTICS FABRICATOR, SENIOR

D.O.T. Conversion: None 754.781

Assists MECHANIC, PLASTICS to wind fiberglass filament (roving) around mandrel to form rocket chamber by performing the following duties working as a member of a crew: (1) Fabricates filament wound cylindrical chambers working as member of work crew: Measures ingredients for plaster by weight or volume, and mixes liquid and dry ingredients in mixer. Applies plaster by hand, to revolving mandrel, under direction of crew leader. Lifts plastered mandrel, using overhead hoist, and places mandrel in fixture in cure oven. Adjusts timing and temperature controls as directed. Places cured plaster-covered mandrel

in holding fixture and pulls rubber insulator, fabricated in sections, over plastered surface, using wrenches. Hoists mandrel into steam jacketed device and turns valves to regulate heat and pressure that vulcanize sections of rubber insulator. Hoists mandrel to platform of longitudinal winding machine. Bolts mandrel to machine platform, using wrenches. Observes action of filament winding equipment to insure that filament is evenly wound over mandrel, and counts number of layers completed while standing on hydraulic lift that runs on track surrounding platform. Positions woven doilies over portholes between successive layers of filament to strengthen and reinforce longitudinally-wound chamber. Hoists chamber to hoop winding machine that winds filament about circumference of chamber. Secures chamber to machine platform, using bolts and wrenches. Observes vertical movement of filament winding device in coordination with turning of platform to insure that filament is wound according to specifications. Wraps chamber in glass cloth to absorb excess resin from filament. Positions clamshell (aluminum mold) over glass cloth to smooth configuration of filament. Encloses clamshell with polyethelene bag used in vacuum forming process performed by other workers. Installs aluminum groundstrap and clips on cured chamber, using glue. Places fittings on aft end of chamber according to directions and positions special fixture directly above fittings. Pulls lever to depress head of fixture that embeds fittings in chamber by means of pressure.

//

Defense Job Title: PROCESSOR, SOLID ROCKET MOTOR "A"

D.O.T. Conversion: PROCESSOR, SOLID PROPELLANT (explosives) 590.884

Performs a variety of duties related to the manufacture and assembly of solid rocket motors and propellants: (1) Cleans chambers and metal hardware: Places chambers and metal parts in vats of detergent solution or solvent to remove dirt and grease, using overhead hoist to lift heavy objects. Removes parts from vats after specified period of time. Removes

PROCESSOR, SOLID ROCKET MOTOR "A" (Continued)

loose material from chamber, using vacuum apparatus. Masks machined surfaces with tape to prevent damage, such as nicks and scratches. Roughens surface of chamber prior to application of adhesive, using sandblasting equipment or power driven abrasive disk hand-tool. Wipes abraded surface of metal parts with cloth to remove dust particles. (2) Insulates chamber interior: Clamps material, such as cork, rubber, phenolic, asbestos, and glasscloth to pattern of chamber interior. Cuts material to size, using router. When using liquid adhesive, applies adhesive to chamber interior, using brushes and spatulas. Positions liner on adhesive covered surface. When using vacuum process, places polyethelene bag over chamber to enclose it. Inserts copper tubing and pressure gage through holes in bag and spreads putty over junction of bag and tubing to form airtight seal. Attaches copper tubing to vacuum pump hoses. Starts pump to remove air from enclosure causing liner to adhere to chamber. Places lined chamber in autoclave, using hoist. Adjusts temperature and timing controls, according to specifications and turns valves to allow steam to enter autoclave. (3) Insulates chamber exterior: Weighs specified ingredients for compound and places them in pressure pot. Clamps lid on pot and turns controls to specified settings for temperature and pressure. Positions chamber in mold using hoist and secures it with clamps. Connects hoses to pressure pot and mold. Turns handle to open valve that causes liquified substance to flow from pot to mold to coat chamber exterior. Removes chamber, covered with self-adhesive rubber insulation material, after specified time for cooling. Covers specified rocket chambers with cork cut to size. Repairs tears by applying adhesive substance and cork dust. Sands rough spots and seams to obtain smooth finish. (4) Paints cork finished chambers, using rollers. Tends conveyor to increase or decrease spread of chamber traveling through production line. (5) Installs and assembles metal components and parts on chamber: Installs parts, such as nozzles, guidance controls, generators, and pressure plates on chamber by clamping, bolting, and lockwiring parts together, following work orders. Tightens bolts with torque wrench applying pressure as specified. Assembles slotted mandrel and core pieces inside missile chamber and secures them with tape and glue. Touches up scratched paint. Applies identifying data to assemblies with stencil, paint, and brush. (6) Conducts hydrostatic tests on assemblies and subassemblies to detect leaks: Connects hoses to cylinders of compressed nitrogen and freon gas and object to be tested. Attaches leak detection fixture to object with clamps. Turns handle to release gas into object at specified pressure. Observes pressure gage on gas filled object ot locate leaks. Weighs and mixes specified ingredients to prepare leak repairing substances. Brushes substance on object to stop leak.

PROCESSOR, SOLID ROCKET MOTOR "A" (Continued)

Retests object after specified length of time: (7) Casts propellant in molds: Lifts propellant pots from conveyor using overhead hoist. Removes propellant sample from pot using vacuum draw off technique. Labels sample container according to batch and mixer number for laboratory analysis. Empties contents of propellant pot into ports surrounding casting bell. Positions core in centering fixture inside chamber. Connects lines of ports to casting bell using quick clamp devices. Turns on vacuum draw equipment that causes propellant to flow from ports into casting bell. Removes chamber from casting bell, using hoist. Cures propellant in oven or turns temperature controls on casting bell to cure propellant in bell. Pulls core from cured propellant using core pulling device attached to hoist. Trims cast propellant to size with knives and cutters, following contours of template. Reams holes in propellant to accommodate various devices, using hand-powered-non-sparking reamer. (8) Molds and installs rubber packing cover: Fits sheet of raw rubber on mold and covers mold with polyethelene bag. Inserts copper tubing and pressure gage through holes in bag. Spreads putty over junction of bag and tubing to form air-tight seal. Pushes cart containing mold into cure oven or lifts mold onto holding fixture in oven using hoist. Attaches hoses from vacuum pump to tubing with clamps. Starts vacuum pump that removes air from bag to shape rubber to mold. Turns controls on oven to set temperature and timer as specified. Slips molded packing cover over chamber and hand sews it to fit missile contours. Sews patches to cover protuberances or to repair tears. (9) Prepares rocket for shipment: Glues or screws transducers for flight instrumentation equipment on various parts of missile assembly. Places igniter in chamber and bolts it to hardware following specifications. Bolts handling rings to missile using wrenches. Laces wire between rubber cover and sealing ring following specified procedure. Installs holding devices and cushioning on carrier according to directions. (10) Helps personnel of higher classification perform various tasks related to the manufacture of solid propellant and the assembly of rocket motors requiring over 1,500 pounds of propellant: Fills hoppers of mixing, blending, and grinding equipment, used to produce propellant, with specified amounts of chemicals. Pushes or hoists propellant pots between mixing station and casting bay. Brings tools and replenishes supplies. Performs duties as directed, such as moving, and positioning rocket motors and propellants with hoist.

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Technical Appendix D

DISCUSSION OF JOB ANALYSIS SCHEDULE AND ANALYSIS OF PHYSICAL DEMANDS FORMS

The Job Analysis Schedule, Analysis of Physical Demands form and Confidential Staffing Schedule and Job Analysis Planning Report were considered to be the best available tools to use for analyzing jobs identified in the course of this study. Descriptions of the major items identified and facsimiles of the forms follow:

JOB ANALYSIS SCHEDULE

Job Title

This item identifies the title by which the job is known in the defense establishment studied. If the establishment title was too general to distinguish between distinct occupations, a descriptive word or phrase in parentheses was added to the title; e.g., ELECTRONIC SYSTEMS RESEARCH TECHNICIAN (COMPUTERS); and ELECTRONIC SYSTEMS RESEARCH TECHNICIAN (INSTRUMENTATION DEVELOPMENT).

D.O.T. Title, Industrial Designation, and Code

These factors were entered after the analysis of the defense occupation was completed. Job titles listed in the Occupational Group Arrangement in Volume II of the Dictionary of Occupational Titles, under the code assigned to the defense job were identified. The job descriptions for these D.O.T. titles were reviewed in Volume I of the Dictionary of Occupational Titles and if a job was identical in all significant respects to the defense occupation, the assigned D.O.T. title, industry, and code were entered on the schedule. If the duties attributed to the defense job differed from those of any D.O.T. job, only the code number derived by the occupational analyst was entered on the schedule form. The code provided an essential element in locating a counterpart occupation.

Description of Duties

The job duties were described concisely applying principles and procedures outlined in the Training and Reference Manual for Job Analysis, (Interim Revision), May, 1965, published by the U. S. Department of Labor.[53] A brief statement was

included at the beginning of each schedule, summarizing the purpose and nature of the job. The remainder of the job description is an elaboration of the summary statement explaining the duties of the job in more detail.

Work Performed and Worker Trait Ratings

This section of the job analysis schedule was used to evaluate the significant job factors. These factors provided additional data with which to assess similarities between defense and counterpart occupations.

Employer Sources and Development of Workers

Employer specifications as to experience and educational background, and training provided by the employers were described. Supplemental items, such as machines, tools, equipment, and work aids, were also mentioned. This additional information simplified assessment of the job in arriving at a determination of comparability.

ANALYSIS OF PHYSICAL DEMAND

Physical Activities

The physical demands of each job were analyzed as they can affect the selection and placement of workers who are not normally considered handicapped or limited but still may not be able to stand the strain of a particular job.

Environmental Conditions

This describes the physical conditions under which a specific job is performed.

CONFIDENTIAL STAFFING SCHEDULE AND JOB ANALYSIS PLANNING REPORT

This document was used to record information relative to the occurrence and distribution of jobs in the two plants. The staffing schedule made possible a tentative matching of jobs in the two plants prior to the selection of jobs for study.

U. S. DEPARTMENT OF LABOR
United States Employment Service
Experimental Job Analysis Schedule

Budget Bureau
No. 44-R1098.2
Sheet 1 of _____
Sched. # _____
Estab. # _____

1. Estab. Job Titles: _____

2. D.O.T. Title, Ind. Desig., Code: _____

3. S.I.C. Code & Title: _____

4. Description of Duties:

D.O.T. Title: _____
D.O.T. Ind. Desig.: _____
Code: _____

5. Work Performed and Worker Traits Ratings:

Worker Functions: Data___, People___, Things___. Weights: Data___, People___, Things___.
Work Field(s): _____
M., P., S.M., S.: _____
Physical Activ.: _____ Environ. Cond: _____
Temp.: _____ Interests: _____ Train. Time: GED___ SVP ___
Aptitudes: G___ V___ N___ S___ P___ Q___ K___ F___ M___ E___ C___

6. Records Control

Analyst:_____ Date: _____ Editor: _____ Date: _____

National Office Reviewer: _____

Other Reviewer, Title, Org.: _____

Comments: _____

_____

_____

EMPLOYER SOURCES AND DEVELOPMENT OF WORKERS

7. Experience: None_____Acceptable _____

_____

8. Education

General Academic. SRW English: _____

Specific Vocational: _____

_____

Academic/Technical: _____

_____

Apprenticeship: _____

9. Training

Inexp. Workers: _____

_____

Exp. Workers: _____

10. Relation to Other Jobs

Promotion From: _____To _____

Transfers: _____

Supervision Received: General___Close___By _____

Supervision Given: None___Number___Titles _____

_____

_____

SUPPLEMENTARY ITEMS

Use Additional Sheets as necessary to record the following items.

11. Machines, Tools, Equipment, and Work Aids.
12. Materials, Products, Subject Matter, and Services.
13. Definitions of Terms.
14. General Comments.
15. Attachments.

U.S. DEPARTMENT OF LABOR
BUREAU OF EMPLOYMENT SECURITY
UNITED STATES EMPLOYMENT SERVICE

June, 1961
Budget Bureau
No. 44-R1161

ANALYSIS OF PHYSICAL DEMANDS
(Experimental)

Sheet _____
PLANT TITLE _____ SCHED. NO. _____
DOT TITLE AND CODE _____ Estab. No. _____

RATINGS: P.A.: S L M H VH 2 3 4 5 6 E.C.: I O B 2 3 4 5 6 7

PHYSICAL ACTIVITIES	COMMENTS

1. STRENGTH

a. Standing ___% Walking ___% Sitting ___%

b. WEIGHT

	Not Present	PRESENT O	F	C
Lifting				
Carrying				
Pushing				
Pulling				

c. Controls:

Hand-arm		Foot-Leg
right		right
left		left
both		both
either		either

	Not Present	PRESENT O	F	C
2. CLIMBING				
BALANCING				
3. STOOPING				
KNEELING				
CROUCHING				
CRAWLING				
4. REACHING				
HANDLING				
FINGERING				
FEELING				
5. TALKING				
Ordinary				
Other				
HEARING				
Ordinary Conversation				
Other Sounds				
6. SEEING				
Acuity, Near				
Acuity, Far				
Depth Perception				
Accommodation				
Color Vision				
Field of Vision				

Analyst _____ Date _____ Establishment Reviewer _____

E. S. Reviewer _____ Date _____ Title _____ Date _____

ENVIRONMENTAL CONDITIONS					COMMENTS
1. WORK LOCATION Inside _____ % Outside _____ % Teamwork _____ % Proximity _____ % Isolation _____ %					
	Not Present	PRESENT			
		O	F	C	
2. EXTREME COLD WITH OR WITHOUT TEMPERATURE CHANGES					
3. EXTREME HEAT WITH OR WITHOUT TEMPERATURE CHANGES					
4. WET AND/OR HUMID					
5. NOISE Estimated maximum number of decibels					
VIBRATION					
6. HAZARDS:					
Mechanical					
Electrical					
Burns					
Explosives					
Radiant Energy					
Other					
7. ATMOSPHERIC CONDITIONS					
Fumes					
Odors					
Dusts					
Mists					
Gases					
Poor Ventilation					
Other					

PROTECTIVE CLOTHING OR PERSONAL DEVICES

CONFIDENTIAL STAFFING SCHEDULE and JOB ANALYSIS PLANNING REPORT

Title Sheet No. _____
Estab. # _____

DEPARTMENT _____ Number of Employees in Department _____

NO.	PLANT TITLE	IN-EX	WAGE RANGE	NO. EMPLOYED			% OF TOTAL	DICTIONARY TITLE	CODE	TR.	COMMENTS
				M	F	T					

In No. (line number) column: number lines by departments, starting the first job in each department with 1.

In Inex. (inexperienced) column: mark an X if no experience is required.

In (treatment) column:
I–identical to D.O.T. def., ratings completed on verification form.
V–def., verified, complete form submitted.
NO–no action taken.
A–job analysis schedule prepared.

Technical Appendix E

SCOPE OF THE SKILLS TRANSFER VALIDATION SURVEY

Appendix E is in two parts. The first describes the survey in terms of industry categories, the second, by occupation.

The entire survey deals with 126 counterpart occupations, as they relate to 35 representative defense jobs, about one-third of the 99 occupations analyzed in detail at the two defense plants. Because 18 of these counterpart occupations match more than one defense job, 126 different occupations account for a total of 144 paired defense-nondefense job combinations.

Table E-1 - Industrial Classification of Counterpart Occupations Surveyed

Part a lists:

The 18 nondefense-related primary industries and their SIC codes (Col. I, II, and III);

The number of counterpart occupations surveyed (Col. IV);

The number of employers surveyed (Col. V); and

The number of Confidential Employer Validation Questionnaires mailed to employers (Col. VI).

Part b lists:

The 5 defense-oriented primary industries, and

Each of the other items described in Part a, above.

Table E-2 - Occupational Classification of Job Combinations Surveyed

This table shows the occupational title and code of each defense job surveyed, as well as their matching counterparts.

Some of the counterpart occupations listed in this appendix are not listed in Appendix A. These were surveyed, but subsequently excluded from Appendix A for various reasons.

Technical Appendix E

SCOPE OF THE SKILLS TRANSFER VALIDATION SURVEY

Table E-1 Industrial Classification of Counterpart Occupations Surveyed

Part a. Nondefense Industries

I	II	III	IV	V	VI
Primary Industry (a)					
Number	Title	SIC Code	No. of Counterpart Occupations Surveyed (b)	No. of Employers Surveyed	No. of Questionnaires Mailed
1	Construction	15,16,17	4	25	78
2	Furniture and Fixtures	25	1	17	17
3	Chemicals	28	10	37	119
4	Petroleum	29	7	24	87
5	Rubber	30	1	15	15
6	Fabricated Metals	34	1 (+2 combs.)	21	45
7	Machinery, except electrical	35	15	89	394
8	Motor Vehicles	371	5	28	75
9	Trailer Coach	3791	1	16	16
10	Electric Sign Manufacturing	3993	1	11	11
11	Railroad	40	1	12	12
12	Air Transport	45	4	15	59
13	Communications	48	5	22	110
14	Electric, Gas, and Sanitary Services	49	16	51	178
15	Professional Equipment Distribution	5086	1	15	17
16	Automobile Sales and Service	55	2	17	28
17	Television and Radio Repair	762	3	17	47
18	Motion Picture Studios	781	1	13	13
Total (Part a.) 18 Primary Industries			79 (+2 combs.)	445	1321

SCOPE OF THE SKILLS TRANSFER VALIDATION SURVEY

Table E-1 Industrial Classification of Counterpart Occupations Surveyed

Part b. Defense-Oriented Industries

I	II	III	IV	V	VI
Primary Industry (a)					
Number	Title	SIC Code	No. of Counterpart Occupations Surveyed (b)	No. of Employers Surveyed	No. of Questionnaires Mailed
20	Electronics, including computers (c)	36	16(+13 combs.)	109	348
21	Aircraft	372	21(+2 combs.)	37	185
22	Ship and Boat Building	373	3	33	59
23	Instruments	38	4(+1 combs.)	17	71
24	Research	89	3	24	76
Total (Part b.) 5 Primary Industries			47(+16 combs.)	220	739
Sample Totals 23 Primary Industries			126(+18 combs.)	665	2060

(a) In this survey, the term Primary Industry means the Industry in the Standard Industrial Classification Manual in which workers in validated non-defense-related occupations are most likely to be employed. Primary Industry is also used in this survey as a means of establishing mutually exclusive industrial categories. Thus, a given sample employer is classified as being in only one primary industry although he may employ workers with a variety of defense-nondefense skill transfer combinations.

(b) In Column IV, the numbers in parenthesis indicate similar occupational combinations which were surveyed. For such combinations, more than one defense-related job was found to have skills transfer possibilities to the same nondefense occupation. Thus, for a total of 126 counterpart occupations surveyed, there were 144 defense-nondefense combinations.

(c) Because of its defense orientation, and the occupational similarity of jobs to those in electronics, the Computer Industry (a portion of SIC 3571) was included with Electronics (SIC 36) rather than with the SIC 35, Machinery, except electrical.

Technical Appendix E

SCOPE OF SKILLS TRANSFER VALIDATION SURVEY
Table E-2 Occupational Classification of Job Combinations Surveyed

I	II	III	IV
Defense Job Title	Equivalent D.O.T. Code With Applicable Suffix	Counterpart Occupation	D.O.T. Code and Suffix
ELECTRONIC SYSTEMS RESEARCH TECHNICIAN (INSTRUMENTATION DEVELOPMENT)	003.181-014	INSPECTOR, SYSTEMS ELECTRICIAN, RESEARCH ELECTRONICS, ASSEMBLER, DEVELOPMENTAL ELECTRONICS MECHANIC	722.281-010 726.281-010 726.281-014 828.281-022
ELECTRONIC SYSTEMS RESEARCH TECHNICIAN	003.181	ELECTRONIC TECHNICIAN INSPECTOR, SYSTEMS* ELECTRICIAN, RESEARCH ELECTRONICS ASSEMBLER, DEVELOPMENTAL* ENGINEERING DEVELOPMENT TECHNICIAN ELECTRONICS MECHANIC	003.181-014 722.281-010 726.281-010 726.281-014 726.281-022 828.281-022
ANALYST, MATHEMATICAL	020.088-010	OPERATIONS-RESEARCH ANALYST MATHEMATICAL TECHNICIAN	020.088-022 020.188-022
DATA REDUCTION SPECIALIST	020.188-022	PROGRAMMER, ENGINEERING AND SCIENTIFIC* WEIGHT ANALYST, AIRCRAFT	020.188-030 020.188-062

SCOPE OF SKILLS TRANSFER VALIDATION SURVEY
Table E-2 Occupational Classification of Job Combinations Surveyed (cont.)

I	II	III	IV
Defense Job Title	Equivalent D.O.T. Code With Applicable Suffix	Counterpart Occupation	D.O.T. Code and Suffix
INSPECTOR, RADIOGRAPHIC	199.381	RADIOGRAPHER	199.381-010
METALIZER, PLASMA ARC	505.782	METAL-SPRAYING-MACHINE OPERATOR, AUTOMATIC	505.782-018
		METAL SPRAYER, PRODUCTION	505.884-022
CHEMICAL PLANT OPERATOR "A"	559.782-050	ALKYLATION OPERATOR	559.782-018
		CATALYST OPERATOR, GASOLINE	559.782-038
		CRESYLATE OPERATOR	559.782-062
		ISOBUTYLENE-EXTRACTION OPERATOR	559.782-106
		MAKE-UP MAN	559.782-126
		MVA-REACTOR OPERATOR, HEAD	559.782-130
		PILOT-CONTROL OPERATOR	559.782-158
		SPECIALTIES OPERATOR	559.782-190
		UTILITY OPERATOR	559.782-226
		WASTE-TREATMENT OPERATOR	559.782-234
JIG AND FIXTURE BUILDER	601.281	MACHINE BUILDER	600.281-018
		DIE MAKER, BENCH, STAMPING*	601.281-010

SCOPE OF SKILLS TRANSFER VALIDATION SURVEY
Table E-2 Occupational Classification of Job Combinations Surveyed (cont.)

I	II	III	IV
Defense Job Title	Equivalent D.O.T. Code With Applicable Suffix	Counterpart Occupation	D.O.T. Code and Suffix
JIG AND FIXTURE BUILDER (Continued)	601.281	INSPECTOR, TOOL	601.281-038
MACHINIST, MILLING MACHINE	605.782-030	BROACHING-MACHINE SET-UP OPERATOR	605.782-018
		SHAPER SET-UP OPERATOR, TOOL	605.782-058
		GRINDER SET-UP OPERATOR, THREAD	609.782-034
		TAPE-CONTROL MACHINE OPERATOR	609.782-054
MACHINIST, LATHE	609.380-010	TURRET-LATHE SET-UP OPERATOR, TOOL	604.280-010
		CHUCKING-MACHINE SET-UP MAN	604.380-010
		SCREW-MACHINE SET-UP MAN, PRODUCTION	604.380-026
		TURRET-LATHE SET-UP OPERATOR	604.380-042
		THREADING-MACHINE SET-UP MAN	609.380-018

Technical Appendix E

SCOPE OF SKILLS TRANSFER VALIDATION SURVEY
Table E-2 Occupational Classification of Job Combinations Surveyed (cont.)

I	II	III	IV
Defense Job Title	Equivalent D.O.T. Code With Applicable Suffix	Counterpart Occupation	D.O.T. Code and Suffix
COMPONENT TEST MECHANIC, SENIOR	625.281-046	HYDRAULIC TESTER	621.281-042
		PNEUMATIC TESTER AND MECHANIC	621.381-022
		DIESEL-ENGINE TESTER	625.281-014
		FUEL-INJECTION SERVICEMAN	625.281-030
		TESTER, PLUMBING SYSTEMS	806.381-054
MODEL MAKER, EXPERIMENTAL	693.281-018	CABINET MAKER	660.280-010
		MODEL MAKER, WOOD	661.380-010
		EXPERIMENTAL-AIRCRAFT MECHANIC	693.280-014
		LOFTSMAN	693.381-010
		MOCK-UP MAN	693.381-014
PROPELLANT MACHINIST	694.380	RUBBER-GOODS CUTTER-FINISHER	690.780-014
INSTRUMENTATION SERVICEMAN "A"	710.281-058	ELECTRICAL INSPECTOR	710.281-014
		ELECTROMECHANICAL TECHNICIAN	710.281-018
		ELECTRONIC-SCALE ASSEMBLER AND TESTER	710.281-022
		GAS-METER PROVER	710.281-026
		GAS-METER REPAIRMAN	710.281-030

SCOPE OF SKILLS TRANSFER VALIDATION SURVEY
Table E-2 Occupational Classification of Job Combinations Surveyed (cont.)

I	II	III	IV
Defense Job Title	Equivalent D.O.T. Code With Applicable Suffix	Counterpart Occupation	D.O.T. Code and Suffix
INSTRUMENTATION SERVICEMAN "A" (Continued)	710.281-058	INDUSTRIAL-GAS SERVICEMAN*	710.281-042
		INSTRUMENT MAN	710.281-050
		INSTRUMENT MECHANIC	710.281-054
		METER REPAIRMAN	710.281-066
		TIN-CASE-METER REPAIRMAN	710.281-074
		WATER-METER REPAIRMAN	710.281-078
INSPECTOR, ELECTRONIC ASSEMBLY, SENIOR	722.281	TESTER, MOTORS AND CONTROLS	721.281-042
		INSTRUMENT SHOPMAN	722.281-018
INSPECTOR, ELECTRONIC ASSEMBLY	726.384-022	CALIBRATOR, RESISTORS	726.384-010
		INSPECTOR, FINISHING	726.384-014
		INSPECTOR, PRINTED CIRCUIT BOARDS	726.384-018
ELECTRICAL BENCH ASSEMBLER	728.884-010	CABLE MAKER	726.884-018
		ELECTRONICS ASSEMBLER	726.884-066
		MODULE ASSEMBLER	726.884-082
		PRINTED-CIRCUIT ASSEMBLER	726.884-094
		ELECTRICAL-LINE SPLICER	728.884-010
		WIREWORKER	728.884-010

SCOPE OF SKILLS TRANSFER VALIDATION SURVEY

Table E-2 Occupational Classification of Job Combinations Surveyed (cont.)

I	II	III	IV
Defense Job Title	Equivalent D.O.T. Code With Applicable Suffix	Counterpart Occupation	D.O.T. Code and Suffix
INSPECTOR, ELECTRONIC-SYSTEMS	729.281	RELAY TESTER	729.281-046
		X-RAY-EQUIPMENT TESTER	729.281-058
		ELECTRICAL EQUIPMENT TESTER	729.381-010
		TESTER, SYSTEMS	729.381-030
MISSILE FABRICATION AND STRUCTURES DEVELOPMENT MECHANIC	804.281-010	FABRICATOR-ASSEMBLER, METAL PRODUCTS	809.381-010
METAL WORKER, BENCH	804.281-010	FABRICATOR-ASSEMBLER, METAL PRODUCTS	809.381-010
MECHANIC, DEVELOPMENTAL ROCKET CONTROLS	806.281	ASSEMBLER, AIRCRAFT STRUCTURES AND SURFACES	806.381-010
		ASSEMBLY MECHANIC, EXPERIMENTAL AIRCRAFT	806.381-018
		TESTER, PLUMBING SYSTEMS*	806.381-054
INSPECTOR, ROCKET ENGINE TEST	806.281	HULL INSPECTOR	806.281-026
		INTERNAL-COMBUSTION-ENGINE INSPECTOR	806.281-030
		FINAL INSPECTOR, TRUCK TRAILER	806.381-022

SCOPE OF SKILLS TRANSFER VALIDATION SURVEY
Table E-2 Occupational Classification of Job Combinations Surveyed (cont.)

I	II	III	IV
Defense Job Title	Equivalent D.O.T. Code With Applicable Suffix	Counterpart Occupation	D.O.T. Code and Suffix
INSPECTOR, ROCKET ENGINE TEST (Continued)	806.281	INSPECTOR, ASSEMBLIES AND INSTALLATIONS	806.381-026
		MAJOR-ASSEMBLY INSPECTOR	806.381-030
STRUCTURES ASSEMBLER, GENERAL	806.381-010	FABRICATOR-ASSEMBLER, METAL PRODUCTS	809.381-010
PRECISION ASSEMBLER	806.781	INTERNAL-COMBUSTION-ENGINE SUBASSEMBLER	706.781-014
		PRECISION ASSEMBLER, BENCH	706.781-018
		ASSEMBLER-INSTALLER, GENERAL	806.781-014
		BENCH MECHANIC, STEEL WELD	806.781-022
		INTERNAL-COMBUSTION-ENGINE ASSEMBLER	806.781-026
ASSEMBLER, GENERAL "A"	806.884-014	AUTOMOBILE-ACCESSORIES INSTALLER	806.884-022
		BOAT OUTFITTER	806.884-030
		BOAT RIGGER	806.884-034
		METAL HANGER	806.884-074

SCOPE OF SKILLS TRANSFER VALIDATION SURVEY
Table E-2 Occupational Classification of Job Combinations Surveyed (cont.)

I	II	III	IV
Defense Job Title	Equivalent D.O.T. Code With Applicable Suffix	Counterpart Occupation	D.O.T. Code and Suffix
ASSEMBLER, GENERAL "A" (Continued)	806.884-014	PRESSURE SEALER-AND-TESTER	806.884-094
ELECTRICAL TECHNICIAN "A"	824.281-014	ELECTRIC-DISTRIBUTION CHECKER	824.281-010
		ELECTRICIAN*	824.281-014
		NEON-SIGN SERVICEMAN	824.281-022
		ELECTRICIAN, STAGE	824.381-010
		STREET-LIGHT SERVICEMAN	824.381-014
ELECTRONIC SYSTEMS RESEARCH TECHNICIAN (COMPUTERS)	828.281-022	INSPECTOR, SYSTEMS	722.281-010
		ELECTRONICS ASSEMBLER, DEVELOPMENTAL	726.281-014
		ELECTRONICS TECHNICIAN, AUTOMATED PROCESS	726.281-018
		TESTER, SYSTEMS	729.381-030
		ELECTRONIC-SALES-AND-SERVICE TECHNICIAN	828.251-010
		ELECTRONICS MECHANIC*	828.281-022
ELECTRONICS TECHNICIAN "A"	828.281-022	RADIO REPAIRMAN	720.281-010
		TAPE-RECORDER REPAIRMAN	720.281-014
		TELEVISION SERVICE-AND-REPAIRMAN	720.281-018

Technical Appendix E

SCOPE OF SKILLS TRANSFER VALIDATION SURVEY

Table E-2 Occupational Classification of Job Combinations Surveyed (cont.)

I	II	III	IV
Defense Job Title	Equivalent D.O.T. Code With Applicable Suffix	Counterpart Occupation	D.O.T. Code and Suffix
ELECTRONICS TECHNICIAN "A" (Continued)	828.281-022	ELECTRONICS TECHNICIAN, AUTOMATED PROCESS*	726.281-018
		PRODUCTION REPAIRMAN*	729.381-022
		TESTER, SYSTEMS	729.381-030
		RADIO MECHANIC	823.281-030
		ELECTRONICS MECHANIC*	828.281-022
INSTRUMENTATION TECHNICIAN "A" (TESTING)	828.381	ELECTRONIC-SCALE ASSEMBLER AND TESTER	710.381-026
		INSPECTOR, SYSTEMS	722.381-010
		TESTER, SYSTEMS	729.581-030
		ELECTRONICS MECHANIC	828.281-022
ELECTRICAL AND ELECTRONICS INSTALLER	829.381	CENTRAL-OFFICE INSTALLER	822.381-018
		EQUIPMENT INSTALLER I	822.381-022
		CABLE MAN	822.884-010
		FRAMEMAN	822.884-014
PAINTER, MISSILE	845.781	PAINTER, SPRAY I	741.884-026
		RAILROAD-CAR LETTERER	845.381-010
		PAINTER, AIRCRAFT	845.781-010
		PAINTER, AUTOMOBILE	845.781-018

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SCOPE OF SKILLS TRANSFER VALIDATION SURVEY
Table E-2 Occupational Classification of Job Combinations Surveyed (cont.)

I	II	III	IV
Defense Job Title	Equivalent D.O.T. Code With Applicable Suffix	Counterpart Occupation	D.O.T. Code and Suffix
ROCKET TEST TECHNICIAN "A"	899.381	AIRCRAFT MECHANIC, RIGGING AND CONTROLS	801.381-018
		GAS-MAIN FITTER	862.381-026
		STEAM SERVICEMAN	862.381-090
CHEMICAL WASTE DISPOSAL MAN	903.883	TANK-TRUCK DRIVER	903.883-014
		LIQUID-FERTILIZER SERVICEMAN	906.883-018
PROPELLANT SERVICEMAN	914.885-018	CEMENT-PUMP OPERATOR	869.782-010
		CONCRETE-PUMP OPERATOR	869.885-014
		LINE WALKER	914.584-010
		OIL PUMPER	914.782-014
		STATION ENGINEER, MAIN LINE	914.782-018
CONTROL MAN	954.782-026	PUMPMAN	549.782-010
		FUEL ATTENDANT	953.782-010
		GAS-PUMPING-STATION OPERATOR	953.782-018
		PUMP-STATION OPERATOR, WATERWORKS	954.782-014

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SCOPE OF SKILLS TRANSFER VALIDATION SURVEY
Table E-2 Occupational Classification of Job Combinations Surveyed (cont.)

I	II	III	IV
Defense Job Title	Equivalent D.O.T. Code With Applicable Suffix	Counterpart Occupation	D.O.T. Code and Suffix
CONTROL MAN (Continued)	954.782-026	WATER-TREATMENT-PLANT OPERATOR*	954.782-026
		SEWAGE-PLANT OPERATOR	955.782-018

Totals: 35 Defense Occupations, and 144 occupational combinations validated for 126 different counterpart occupations.

Note: An asterisk following certain job titles in Column III indicates counterpart occupations where employers received validation questionnaires, but subsequently were excluded from Appendix A for various reasons.

Technical Appendix F

EMPLOYMENT OUTLOOK FOR COUNTERPART OCCUPATIONS IN NONDEFENSE INDUSTRIES

A. Description of Contents

This appendix is an analysis of employment prospects for each of the (nondefense) primary industries most likely to provide employment opportunities for the related occupations surveyed. Here, as in Appendix E-1, part a, primary industries numbered one to eighteen are treated consecutively.

For each Primary Industry, the analysis consists of four parts:

1. The first part compares current and projected employment for the entire United States with California, and summarizes employment prospects to 1975.

2. The second part is a discussion of the probable effect of defense cutbacks on the primary industry as indicated by published input-output studies.

3. The third part of each industry analysis considers defense jobs and their surveyed counterparts for which the long-term job outlook was good. Other possible barriers to skills transfer such as wage comparability, length of retraining, and hiring practices are disregarded in this part of the analysis.

4. The final part lists, in tabular form, the surveyed counterpart occupations found primarily in the industry. This table contains the following information:

   a. D.O.T. code and title (Columns I & II).

   b. Volume status of the counterpart occupation (Column III). For the purpose of this study, a volume occupation is one in which composite survey response indicated current employment of more than 100 workers. A plus sign (+) in the appropriate space indicates a volume occupation,

while the absence of an entry indicates fewer workers in the occupation.

c. The job outlook rating (Column IV). The basis for these ratings of "Good", "Fair", "Poor", or "INA" is given in the introduction to Technical Appendix A.

d. The areas of principal job opportunities in California (Column V). These are, for the most part, the Standard Metropolitan Areas of the State.

B. Origin of Industry Employment Data

Figures for average 1965 employment were obtained from the following sources:

1. United States

Employees in Nonagricultural Establishments, by Industry, as published in Monthly Labor Review, Revision of October, 1966.

2. California

a. Employment in two- and three-digit primary industries: California Department of Industrial Relations. Estimated Number of Wage and Salary Workers in Nonagricultural Establishments, by Industry, California 1939...1966 23.

b. Employment in four digit industries: California Department of Employment, California Employment and Payrolls, Report 127, #28d.12

National industry projections originate in The Outlook For Technological Change and Employment, February, 1966. 38

Implicit in these assumptions is a 1975 labor force of 94.1 million. The number of military personnel (2.7 million), corresponds to the number in 1964. A 1975 unemployment rate of three percent is assumed in these forecasts.

Technical Appendix F

Employment Outlook for the Construction Industry and Related Occupations Surveyed

Primary Industry #1 SIC 15,16,17

Estimated Employment and Projected Employment Change, U.S. and California

	1965 EMPLOYMENT *	PROJECTED EMPLOYMENT CHANGE 1965-75
U.S.	3,181,000	+ 32%
Calif.	323,700	Rate of increase less than U.S.

* Excludes self-employed.

Summary of Employment Prospects:

U.S.: Employment requirements are expected to increase by just under one-third in the 1965 - 1975 period, because of a rapid rise in construction activity. Labor requirements will not increase so fast as construction activity in the decade because output per worker will continue to increase. Prefabrication of many units will decrease on-site construction time.

California: If present trends continue, California, which now has a relatively high level of construction employment compared with the nation, will not equal the national rate of increase over the decade. Even so, many thousands of new construction jobs would be created in California.

Of the nondefense-related occupations studied, that of ELECTRICIAN accounts for a comparatively large number of workers. It also has an attractive wage scale. Nationally, the prospects are for this occupation to increase at about the same rate as construction trades in general.

Effect of Defense Cutbacks:

A 20 percent cutback in defense, with offset spending, in the civilian sector would have a slight but positive effect on the construction industry. This would tend to amplify slightly the predicted employment gains for construction occupations.[5]

Technical Appendix F

Occupations for Which Transfer Potential Is Not Impaired by Labor Market Outlook:

If the defense cutbacks occur during the forecast period, workers employed in California defense plants as ELECTRICAL TECHNICIAN would likely not be hindered from transferring to the counterpart occupation of ELECTRICIAN for lack of job opportunities. Sample respondents indicate volume job opportunities in Los Angeles and San Francisco Bay Areas, the two largest labor market areas of the state. In the rapidly growing areas of Orange County and San Jose, long-range job prospects for ELECTRICIANS are particularly bright, despite recent (1966-67) slumps in building activity.

Possibilities for significant transfer of skills to the remaining three counterpart occupations in this primary industry appear to offer negligible transfer potential either now or in the foreseeable future when job outlook is taken into account.

Technical Appendix F

Employment Outlook in Counterpart Occupations with Job Opportunities Primarily in the Construction Industry (SIC 15,16,17) P.I. #1

I	II	III	IV	V
D.O.T. CODE AND SUFFIX	OCCUPATIONAL TITLE	VOLUME	JOB OUTLOOK	AREAS OF PRINCIPAL JOB OPPORTUNITIES IN CALIFORNIA
824.281-010	ELECTRIC-DISTRIBUTION CHECKER (const.; light, heat, & power)		INA	INA
824.281-022	ELECTRICIAN (any ind.)	+	Good	S.F. Bay, San Jose, L.A., Orange County
869.782-010	CEMENT-PUMP OPERATOR (const.)		Fair	S.F. Bay Area
869.885-014	CONCRETE-PUMP OPERATOR (const.)		INA	INA

Technical Appendix F

Employment Outlook for the Furniture and Fixtures Industry and Related Occupations Surveyed

Primary Industry #2 SIC 25

Estimated Employment and Projected Employment Change, U.S. and California

	1965 EMPLOYMENT	PROJECTED EMPLOYMENT CHANGE 1965-75
U.S.	429,100	+ 19%
Calif.	32,600	Rate of increase same as U.S.

Summary of Employment Prospects:

U.S.: For the nation as a whole, a 19 percent over-the-decade employment increase is projected for the Furniture and Fixtures Industry. This increase will occur in spite of persistently increasing worker output and production efficiency. The number of production workers will not increase as fast as total employment.

California: In the Furniture and Fixtures Industry, the outlook is for about the same rate of growth in California as nationwide.

California Occupational Guides for the occupation of CABINET MAKER indicate as many as 8,000 working in the L.A. Area, with an additional 2,000 in the San Francisco Bay Area. Prospects for the future indicate ample job opportunities in this trade for workers who have completed formal apprenticeships.

Effect of Defense Cutbacks:

The impact of a reduction in defense spending on employment in the Furniture and Fixtures Industry is not known. However, neither of the closely related industries (lumber and wood products; construction) seems likely to be affected adversely by defense cutbacks. Therefore it can be reasonably inferred that the Furniture and Fixtures Industry would also be unscathed in the process.

Technical Appendix F

Occupations for Which Transfer Potential Is Not Impaired by Labor Market Outlook:

In the event that the assumed defense cutbacks occurred in the forecast period, the transfer of persons employed in California defense plants as MODEL MAKER, EXPERIMENTAL to the counterpart job of CABINET MAKER would not be hindered by lack of job opportunities. Responding employers indicate increasing employment opportunities for CABINET MAKER, a volume occupation.

Technical Appendix F

Employment Outlook in Counterpart Occupations with Job Opportunities Primarily in the Furniture and Fixtures Industry (SIC 25) P.I. #2

I	II	III	IV	V
D.O.T. CODE AND SUFFIX	OCCUPATIONAL TITLE	VOLUME	JOB OUTLOOK	AREAS OF PRINCIPAL JOB OPPORTUNITIES IN CALIFORNIA
660.280-010	CABINET MAKER (woodworking)	+	Good	Los Angeles, San Francisco Bay Area

Technical Appendix F

Employment Outlook for the Chemicals Industry and Related Occupations Surveyed

Primary Industry #3 SIC 28

Estimated Employment and Projected Employment Change, U.S. and California

	1965 EMPLOYMENT	PROJECTED EMPLOYMENT CHANGE 1965-75
U.S.	906,400	+ 21%
Calif.	47,000	Rate of increase faster than U.S.

Summary of Employment Prospects:

U.S.: Employment requirements in plants manufacturing chemicals and allied products are expected to increase by more than 20 percent over the decade. This rate is considerably greater than that for manufacturing as a whole. Within the industry, one-third of 1964 total employment was in establishments making industrial chemicals; one-fifth was in plants producing plastic materials and synthetic resins. The remaining workers were employed in other categories of the chemical industry. More than half the products now sold by the chemical industry were not in commercial production in 1939. Innovation is expected to continue as a growth factor throughout the next decade.

California: The projection of present trends indicates a more rapid rate of increase for this state than for the nation as a whole. In California, however, the chemical industry has not developed to the extent that it has in the industrial states of the East. For this reason, occupational opportunities within this industry will be very selective.

Effect of Defense Cutbacks:

According to Leontief's input-output analysis, a 20 percent reduction in the defense sector with offset spending in the nondefense sector of the economy, would have a small but positive effect on employment in the chemicals industry.5

Labor market prospects for individual occupations would therefore seem to be unimpaired by assumed cutbacks.

Occupations for Which Transfer Potential Is Not Impaired by Labor Market Outlook:

Several of the occupations in the Chemicals Industry for which sample respondents gave usable employment projections appear to offer volume transfer opportunities for workers whose jobs in defense plants were analyzed as a part of this study. Employees in defense plants, who, as a result of defense cutbacks might lose their jobs as CHEMICAL PLANT OPERATOR would have fair opportunities in volume to transfer to occupations in the California Chemical Industry such as PILOT-CONTROL OPERATOR, SPECIALTIES OPERATOR, and UTILITIES OPERATOR. Although employers did not predict a rate of expansion for these jobs as great as for that of the industry as a whole there would be job openings for qualified workers primarily in the San Francisco Bay Area and the Los Angeles Metropolitan Area.

The defense-related job of CHEMICAL WASTE DISPOSAL MAN has good transfer potential to the counterpart occupation of LIQUID-FERTILIZER SERVICEMAN, which responding employers identify as a volume job.

Technical Appendix F

Employment Outlook in Counterpart Occupations with Job Opportunities Primarily in the Chemical Industry (SIC 28) P.I. #3

I	II	III	IV	V
D.O.T. CODE AND SUFFIX	OCCUPATIONAL TITLE	VOLUME	JOB OUTLOOK	AREAS OF PRINCIPAL JOB OPPORTUNITIES IN CALIFORNIA
559.782-018	ALKYLATION OPERATOR (chem. petroleum)	+	Poor	S.F. Bay Area, L.A. Area
559.782-062	CRESYLATE OPERATOR (chem.)		INA	INA
559.782-106	ISOBUTYLENE-EXTRACTION OPERATOR (chem.)		INA	INA
559.782-126	MAKE-UP MAN (chem.)		Poor	S.F. Bay Area, L.A. Area
559.782-130	MVA-REACTOR OPERATOR HEAD (chem.)		Poor	No Calif. jobs in this occupation.
559.782-154	PILOT-CONTROL OPERATOR (plastics mfg.)	+	Fair	S.F. Bay Area, L.A. Area
559.782-190	SPECIALTIES OPERATOR (chem.)	+	Fair	S.F. Bay Area, L.A. Area
559.782-226	UTILITY OPERATOR (chem.)	+	Fair	L.A. Area

Technical Appendix F

Employment Outlook in Counterpart Occupations with Job Opportunities Primarily in the Chemical Industry (SIC 28) P.I. #3

I	II	III	IV	V
D.O.T. CODE AND SUFFIX	OCCUPATIONAL TITLE	VOLUME	JOB OUTLOOK	AREAS OF PRINCIPAL JOB OPPORTUNITIES IN CALIFORNIA
559.782-234	WASTE-TREATMENT OPERATOR (chem.)		Poor	Few job opportunities projected for California.
906.883-018	LIQUID-FERTILIZER SERVICEMAN (agric.)	+	Good	Interior Valley, Imperial Valley, other farming areas.

Technical Appendix F

Employment Outlook for the Petroleum Industry and Related Occupations Surveyed

Primary Industry #4 SIC 29

Estimated Employment and Projected Employment Change, U.S. and California

	1965 EMPLOYMENT	PROJECTED EMPLOYMENT CHANGE 1965-75
U.S.	182,000	- 12%
Calif.	28,400	Rate of decrease faster than U.S.

Summary of Employment Prospects:

U.S.: Manpower requirements in this major industry group are expected to decline substantially between 1965 and 1975, in spite of significant increases in the production of petroleum.

Employment in petroleum and natural gas production and processing is expected to continue the gradual decline which began during the 1950's. There will still be many job opportunities in this industry during the 1965-1975 decade, however. The employment impact of labor-saving technological developments is expected to be less than during the past 10 years.

Production worker requirements are expected to decline more rapidly than total employment. Technical advances have created a need for a skilled, well-trained, regular maintenance force that makes up a large proportion of refinery employment. A significant number (about 5,500) of contract service workers were performing maintenance duties in petroleum refineries.

Technological innovations may also change worker skill requirements. Maintenance workers may need multiple craft skills to enable them to work in more than one (occupational) area. This last statement is reinforced by sample survey results. California employers indicated that many workers in this industry spent only part of their time in certain occupations.

Technical Appendix F

The use of increasingly complex electronic instrumentation will raise skill requirements for INSTRUMENT REPAIRMEN.

California: In this state, the rate of employment decrease is expected to be more rapid than that for the nation. If present trends continue, nearly one out of four California petroleum workers will no longer have jobs in this industry by 1975.

Effect of Defense Cutbacks:
The Petroleum Industry, according to Leontief's input-output analysis, would be one of the industries adversely affected by a 20 percent cutback in defense programs, with offset spending in the nondefense sector.5 The impact would involve a net decline in employment of less than one percent. This would have the overall effect of slightly accelerating the rate of decrease.

Occupations for Which Potential Transfer Is Not Impaired by Labor Market Outlook:
Workers from defense plants employed in the occupation of CHEMICAL WASTE DISPOSAL MAN would find ample skills transfer opportunities to the occupation of TANK-TRUCK DRIVER in the petroleum industry particularly in the Los Angeles Area. The only other petroleum industry occupation surveyed for which there would be volume prospects for skills transfer is for the job combination PROPELLANT SERVICEMAN to STATION ENGINEER, MAIN LINE. Job opportunities in this latter volume occupation are expected to be fair over the next decade, whether or not the assumed defense cutbacks actually take place.

Technical Appendix F

Employment Outlook in Counterpart Occupations with Job Opportunities Primarily in the Petroleum Industry (SIC 29) P.I. #4

I	II	III	IV	V
D.O.T. CODE AND SUFFIX	OCCUPATIONAL TITLE	VOLUME	JOB OUTLOOK	AREAS OF PRINCIPAL JOB OPPORTUNITIES IN CALIFORNIA
549.782-022	PUMPMAN I (petrol. refin.)	+	Poor	Declining occupation with few projected opportunities.
559.782-038	CATALYST OPERATOR, GASOLINE (chem.; petrol. refin.)		Poor	No increase predicted by respondents.
728.884-014	ELECTRICAL-LINE SPLICER (petrol. production)		Poor	A scarce occupation performed as an intermittent occupation.
903.883-014	TANK-TRUCK DRIVER (petrol. refin. ret. tr.; whole tr.)	+	Good	Job opportunities mostly in L.A. Area.
914.584-010	LINE WALKER (petrol. production; petrol. refin.; pipe lines)		Poor	A scarce and declining occupation.

Technical Appendix F

Employment Outlook in Counterpart Occupations with Job Opportunities Primarily in the Petroleum Industry (SIC 29) P.I. #4

I	II	III	IV	V
D.O.T. CODE AND SUFFIX	OCCUPATIONAL TITLE	VOLUME	JOB OUTLOOK	AREAS OF PRINCIPAL JOB OPPORTUNITIES IN CALIFORNIA
914.782-014	OIL PUMPER (petrol. production)	+	Poor	A declining occupation in Calif. Few new job opportunities for the future.
914.782-018	STATION ENGINEER, MAIN LINE (pipelines)	+	Fair	L.A. Area

Technical Appendix F

Employment Outlook for the Rubber and Miscellaneous Plastic Products Industry and Related Occupations Surveyed

Primary Industry #5 SIC 30

Estimated Employment and Projected Employment Change, U.S. and California

	1965 EMPLOYMENT	PROJECTED EMPLOYMENT CHANGE 1965-75
U.S.	471,500	+ 23%
Calif.	28,000	Rate of increase same as U.S.

Summary of Employment Prospects:

U.S.: Manpower requirements for the Rubber and Miscellaneous Plastic Products major industry group are expected to increase rapidly in the forecast decade. By 1975, employment will exceed the 1965 level by nearly one-fourth.

California: If present trends persist, employment in the California Rubber and Miscellaneous Plastic Products Industry should increase at about the same rate as nationally. California, with only about 6 percent of the nation's total employment for the industry is not expected to increase its relative share by 1975.

Effect of Defense Cutbacks:

In the event of a 20 percent cutback in defense with offsetting spending in the nondefense sector, employment in rubber and rubber products would gain slightly.5

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Occupations for Which Transfer Potential Is Not Impaired by Labor Market Outlook:

Workers employed as PROPELLANT MACHINIST, might well consider transfer to the nondefense occupation of RUBBER-GOODS CUTTER-FINISHER in the event of cutbacks. Responding employers regard the latter as having good prospects, although it is not a volume occupation.

Although the industry is largely concentrated in Los Angeles and adjacent Southern California Areas, job opportunities were reported in other areas.

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Employment Outlook in Counterpart Occupations with Job Opportunities Primarily in the Rubber and Miscellaneous Plastic Products Industry (SIC 30) P.I. #5

I	II	III	IV	V
D.O.T. CODE AND SUFFIX	OCCUPATIONAL TITLE	VOLUME	JOB OUTLOOK	AREAS OF PRINCIPAL JOB OPPORTUNITIES IN CALIFORNIA
690.780-014	RUBBER-GOODS CUTTER-FINISHER (rubber goods)		Good	Scattered locations

Technical Appendix F

Employment Outlook for the Fabricated Metal Products Industry and Related Occupations Surveyed

Primary Industry #6 SIC 34

Estimated Employment and Projected Employment Change, U.S. and California

	1965 EMPLOYMENT	PROJECTED EMPLOYMENT CHANGE 1965-75
U.S.	1,268,300	+ 18%
Calif.	99,300	Rate of increase faster than U.S.

Summary of Employment Prospects:

U.S.: The high levels of economic activity anticipated in the forecast decade will stimulate output of fabricated metal products. Employment, however, will gain less rapidly as technological innovation continues its course.

California: This state, with approximately eight percent of the nation's fabricated metals employment in 1965, is expected to increase its share by 1975. Employment growth in fabricated metal products will take place in spite of a continuing downward trend of employment in metal cans manufacturing, formerly one of the principal components of this industry in California.

Effect of Defense Cutbacks:

Assuming a 20 percent cutback in military programs, with offset spending in the nondefense sector of the economy, employment in the fabricated metals industry would gain slightly.5

Occupations for Which Transfer Potential Is Not Impaired by Labor Market Outlook:

In the event of defense cutbacks prospects would be good for defense workers employed as STRUCTURES ASSEMBLER, GENERAL; METAL WORKER, BENCH; and MISSILE FABRICATION AND STRUCTURES DEVELOPMENT MECHANIC, to transfer to the non-defense-related occupation of FABRICATOR-ASSEMBLER, METAL

PRODUCTS possibly in considerable numbers. This is a situation where one counterpart occupation accounts for more than one transfer combination. See footnote b of Appendix E1.

Since more than 350 workers held these defense-related jobs in one of the aerospace plants studied, this counterpart occupation appears to warrant special consideration in terms of skills transfer potential. In addition, the occupation of METAL WORKER, BENCH has been particularly vulnerable in past layoff situations.

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Employment Outlook in Counterpart Occupations with Job Opportunities Primarily in the Fabricated Metal Products Industry (SIC 34) P.I. #6

I	II	III	IV	V
D.O.T. CODE AND SUFFIX	OCCUPATIONAL TITLE	VOLUME	JOB OUTLOOK	AREAS OF PRINCIPAL JOB OPPORTUNITIES IN CALIFORNIA
809.381-010	FABRICATOR-ASSEMBLER, METAL PRODUCTS (any ind.)	+	Good	Los Angeles, San Francisco Bay Area, San Jose

Technical Appendix F

Employment Outlook for the Machinery, Except Electrical Industry and for Related Counterpart Occupations

Primary Industry #7 SIC 35

Estimated Employment and Projected Employment Change, U.S. and California

	1965 EMPLOYMENT	PROJECTED EMPLOYMENT CHANGE 1965-75
U.S.	1,725,800	+ 16%
Calif.	103,500	Rate of increase faster than U.S.

Summary of Employment Prospects:

U.S.: Employment in the Machinery, Except Electrical Industry group is expected to increase substantially during the decade but not as rapidly as output, because of increasing application of labor-saving technology. Many technological advances, which may be strong factors in limiting long-range employment prospects, are not expected to be put into practice to a significant degree during the 1965-1975 decade.

With respect to the broad occupational category of Machinists, employment requirements are expected to increase slightly over the next decade, with a total of about 500,000 estimated by 1975.[38]

California: Employment projections for this industry group indicate a faster rate of growth in California than in the nation as a whole.

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Counterpart occupations were identified in the industries listed below. The relative importance of these industries in California is shown by the following employment figures:

Primary Industry Designation	(SIC) 4 digit	Industry	Approx. 1965 Employment
7 A	3519	Diesel Engine Mfg.	2,000
7 B	3522	Farm Equipment Mfg.	3,500
7 C*	3571	Computer Mfg.	26,000
7 D	3599	Machine Shops	20,000
		Total (7A, B, C, D)	51,500
		Total Industry 35, California	103,500

*(Occupations primarily found in computer manufacturing are discussed in Appendix G, with Primary Industry #20, Electronics.)

Thus, about one half of the state's employment in group 35 is in these four detailed industries. While SIC 3571 has a definite defense orientation, the remaining three are not considered as defense-oriented by the Census of Manufacturers Shipments of Defense-Oriented Industries.47

Effect of Defense Cutbacks: The net effect of a defense cutback of the kind postulated for the purposes of this study is not precisely determined for all of industry 35. Both farm and industrial machinery are placed by Leontief with the industries which would gain slightly in the event of such cutbacks.5

Occupations for Which Transfer Potential Is Not Impaired by Labor Market Outlook: Although the outlook for all components of Primary Industry 35 is not entirely accounted for, the prospects for skills transfer to the occupations found primarily in the industries listed below should be unimpaired by defense cutbacks. These include:

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Counterpart Occupations found primarily in 7 A, Diesel Engine Manufacturing:

Defense workers employed as COMPONENT TEST MECHANIC, SENIOR would find good prospects to transfer their skills to the occupations of DIESEL-ENGINE TESTER, and FUEL-INJECTION SERVICEMAN.

Counterpart Occupations found primarily in 7 B, Farm Equipment Manufacturing:
Workers in defense plants employed as ROCKET ENGINE TEST INSPECTORS would find good prospects to transfer their skills to the occupation of MAJOR-ASSEMBLY INSPECTOR.

Counterpart Occupations in 7 D. Machine Shops:
Defense plant workers employed as JIG AND FIXTURE BUILDER would have good prospects to transfer their skills to the occupations of MACHINE BUILDER; DIE MAKER, BENCH STAMPING; and INSPECTOR, TOOL.

Those employed in defense plants as MACHINIST, MILLING MACHINE might, according to sample respondents, have good prospects of transferring their skills to SHAPER SET-UP OPERATOR, TOOL; TAPE-CONTROL MACHINE OPERATOR; or GRINDER SET-UP OPERATOR, THREAD.

A relatively large volume of defense workers employed as MACHINIST, LATHE would have good prospects to transfer their skills to the counterpart occupation of CHUCKING MACHINE SET-UP MAN. There would also be good prospects for a smaller number of MACHINIST, LATHE to transfer their skills to the occupation of SCREW-MACHINE SET-UP MAN, PRODUCTION.

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Employment Outlook in Counterpart Occupations with Job Opportunities Primarily in the Diesel Engine Manufacturing Industry (SIC 3519) P.I. #7 A

I	II	III	IV	V
D.O.T. CODE AND SUFFIX	OCCUPATIONAL TITLE	VOLUME	JOB OUTLOOK	AREAS OF PRINCIPAL JOB OPPORTUNITIES IN CALIFORNIA
625.281-014	DIESEL-ENGINE TESTER (engine & turbine)		Good	S.F.; L.A.
625.281-030	FUEL-INJECTION SERVICEMAN (any ind.)		Good	Scattered throughout state.

402/403

Employment Outlook in Counterpart Occupations with Job Opportunities Primarily in the Farm Equipment Industry (SIC 3522) P.I. #7 B

I	II	III	IV	V
D.O.T. CODE AND SUFFIX	OCCUPATIONAL TITLE	VOLUME	JOB OUTLOOK	AREAS OF PRINCIPAL JOB OPPORTUNITIES IN CALIFORNIA
806.381-030	MAJOR-ASSEMBLY INSPECTOR (agric. equip.)		Good	Central Valley, S.F. Bay Area, & San Jose

404/405

Technical Appendix F

Employment Outlook in Counterpart Occupations with Job Opportunities Primarily in the Machine Shop Industry (SIC 3599) P.I. #7 D

I	II	III	IV	V
D.O.T. CODE AND SUFFIX	OCCUPATIONAL TITLE	VOLUME	JOB OUTLOOK	AREAS OF PRINCIPAL JOB OPPORTUNITIES IN CALIFORNIA
600.281-018	MACHINE BUILDER (mach. shop)		Good	L.A.
601.281-010	DIE MAKER, BENCH, STAMPING (mach. shop)		Good	L.A.
601.281-038	INSPECTOR, TOOL (mach. shop)		Good	L.A., Orange County
604.280-030	TURRET-LATHE SET-UP OPERATOR, TOOL (mach. shop)	+	Fair	L.A., S.F. Bay Area
604.380-010	CHUCKING-MACHINE SET-UP MAN (mach. shop)		Good	L.A., S.F. Bay Area
604.380-026	SCREW-MACHINE SET-UP MAN, PRODUCTION (mach. shop)	+	Good	L.A., S.F. Bay Area

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Employment Outlook in Counterpart Occupations with Job Opportunities Primarily in the Machine Shop Industry (SIC 3599) P.I. #7 D

I	II	III	IV	V
D.O.T. CODE AND SUFFIX	OCCUPATIONAL TITLE	VOLUME	JOB OUTLOOK	AREAS OF PRINCIPAL JOB OPPORTUNITIES IN CALIFORNIA
604.380-042	TURRET-LATHE SET-UP OPERATOR (mach. shop)		Fair	L.A.
605.782-018	BROACHING-MACHINE SET-UP OPERATOR (mach. shop)		Poor	A scarce occupation in California
605.782-058	SHAPER SET-UP OPERATOR, TOOL (mach. shop)		Good	L.A.
609.380-018	THREADING MACHINE SET-UP MAN (mach. shop)		Poor	A very scarce occupation in California
609.782-034	GRINDER SET-UP OPERATOR, THREAD (mach. shop)		Good	L.A., Orange County, S.F. Bay Area
609.782-054	TAPE-CONTROL MACHINE OPERATOR (mach. shop)		Good	L.A., Orange County, S.F. Bay Area

Technical Appendix F

Employment Outlook for the Motor Vehicles Industry and for Related Counterpart Occupations

Primary Industry #8 SIC 371

Estimated Employment and Projected Employment Change, U.S. and California

	1965 EMPLOYMENT	PROJECTED EMPLOYMENT CHANGE 1965-75
U.S.	843,400	- 5%
Calif.	35,000	Indeterminate

Summary of Employment Prospects:

U.S.: Employment requirements for 1975 in the motor vehicle and motor vehicle equipment industry group are expected to be below the 1965 level, despite a significant increase in production.

However, the automobile industry is expected to provide thousands of job openings during the 1965-1975 decade to replace experienced workers who transfer to other industries, retire, or die. Retirement and death should provide about 15,000 job openings annually.

California: Most of the automobile plants in California are assembly plants, with complete engines and other parts shipped here from the Eastern United States.

Employment here, based on recent trends, will probably increase over the next decade. It is not likely that sweeping gains will be registered, unless entire production plants were to move here, an unlikely prospect.

Effect of Defense Cutbacks:

In the event of a 20 percent cutback in military programs with offset spending in the nondefense sector of the economy, motor vehicles employment would gain slightly.5

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Occupations for Which Transfer Potential Is Not Impaired by Labor Market Outlook:

Under circumstances of a defense cutback like that described above, ROCKET ENGINE TEST INSPECTORS would likely be able to transfer to the volume nondefense occupation INTERNAL-COMBUSTION-ENGINE INSPECTOR; PRECISION ASSEMBLERS to INTERNAL-COMBUSTION-ENGINE ASSEMBLER and INTERNAL-COMBUSTION-ENGINE SUBASSEMBLER; and MISSILE PAINTERS to the volume occupation of PAINTER, SPRAY I.

Technical Appendix F

Employment Outlook in Counterpart Occupations with Job Opportunities Primarily in the Motor Vehicles Industry (SIC 371) P.I. #8

I	II	III	IV	V
D.O.T. CODE AND SUFFIX	OCCUPATIONAL TITLE	VOLUME	JOB OUTLOOK	AREAS OF PRINCIPAL JOB OPPORTUNITIES IN CALIFORNIA
706.781-014	INTERNAL-COMBUSTION-ENGINE SUBASSEMBLER (engine & turbine)	+	Good	L.A., San Jose
741.884-026	PAINTER, SPRAY I (any ind.)	+	Good	L.A., S.F. Bay Area, San Jose
806.281-030	INTERNAL-COMBUSTION-ENGINE INSPECTOR (engine & turbine)	+	Good	L.A., San Jose
806.381-022	FINAL INSPECTOR, TRUCK TRAILER (auto mfg.)		INA	INA
806.781-026	INTERNAL-COMBUSTION-ENGINE ASSEMBLER (engine & turbine)	+	Good	L.A., San Jose

Technical Appendix F

Employment Outlook for the Trailer Coach Industry and for Related Counterpart Occupations

Primary Industry #9 SIC 3791

Estimated Employment and Projected Employment Change, U.S. and California

	1965 EMPLOYMENT	PROJECTED EMPLOYMENT CHANGE 1965-75
U.S.	50,000	INA
Calif.	7,700	INA

Summary of Employment Prospects:

U.S.: Nationwide employment is estimated at 50,000 in 1965. Reliable over-the-decade projections for this industry sector are not available.

California: The Trailer Coach Industry in this state now accounts for 9 of every 10 workers in Industry 379, Miscellaneous Transportation Equipment which employed 4,100 in 1958 and 8,600 in 1965, more than doubling over this seven-year period. At the present rate, employment over the next decade should more than double again. California now has more than its share of this industry, 15 percent of estimated U.S. employment.

Effect of Defense Cutbacks:

No direct assessment of the net effect of a 20 percent cutback in defense expenditures has been made by Leontief in this case.[5] However, industries of a similar nature are expected to have slightly accelerating employment under these circumstances.

Occupations for Which Transfer Potential Is Not Impaired by Labor Market Outlook:

The assessment of bright prospects for this industry in California is reinforced by employer response to the survey questionnaire. There are volume opportunities for workers employed as ASSEMBLER, GENERAL "A" in California defense plants to transfer to the job of METAL HANGER, should the postulated defense cutbacks occur in the forecast period.

Technical Appendix F

Employment Outlook in Counterpart Occupations with Job Opportunities Primarily in the Trailer Coach Industry (SIC 3791) P.I. #9

I	II	III	IV	V
D.O.T. CODE AND SUFFIX	OCCUPATIONAL TITLE	VOLUME	JOB OUTLOOK	AREAS OF PRINCIPAL JOB OPPORTUNITIES IN CALIFORNIA
806.884-074	METAL HANGER (trans. equip.)	+	Good	Los Angeles & Riverside County

4/4/415

Technical Appendix F

Employment Outlook for the Electric Sign Manufacturing Industry and for Related Counterpart Occupations

Primary Industry #10 SIC 3993

Estimated Employment and Projected Employment Change, U.S. and California

	1965 EMPLOYMENT	PROJECTED EMPLOYMENT CHANGE 1965-75
U.S.	INA	INA
Calif.	3,600	INA

Summary of Employment Prospects:

U.S.: Employment projections are not available for the U.S. Electrical Sign Manufacturing Industry. However, Misc. Manufacturing Industries (SIC 39), the major industry group is expected to increase by one-fifth between 1964 and 1975.

California: Every respondent to the survey which was directed only to the largest employers predicted increased employment for 1970 and 1975. Hence the largest employers who account for more than 20 percent of the total estimated employment will likely provide substantially increased employment opportunities in the forecast period.

Effect of Defense Cutbacks:

According to Leontief's results, a 20 percent cutback in defense, with offset spending in the civilian sector of the economy, would benefit Misc. Manufacturing Industries.[5]

Occupations for Which Transfer Potential Is Not Impaired by Labor Market Outlook:

Only one job combination was validated in this industry. Prospects are good for the transfer of skills from the defense-related occupation of ELECTRICAL TECHNICIAN to the counterpart NEON-SIGN SERVICEMAN. Although electrical sign manufacturing is a relatively small industry in terms of employment, employer respondents indicated that a substantial proportion of this industry's total employment (17 percent of a limited sample) are working in this occupation. Thus, the occupation of NEON-SIGN SERVICEMAN could offer skills transfer prospects for a relatively large number of persons employed as ELECTRICAL TECHNICIAN in defense industries - in the event that cutbacks in defense spending should occur.

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Employment Outlook in Counterpart Occupations with Job Opportunities Primarily in the Electric Sign Manufacturing Industry (SIC 3993) P.I. #10

I	II	III	IV	V
D.O.T. CODE AND SUFFIX	OCCUPATIONAL TITLE	VOLUME	JOB OUTLOOK	AREAS OF PRINCIPAL JOB OPPORTUNITIES IN CALIFORNIA
824.281-022	NEON-SIGN SERVICEMAN (signs)	+	Good	Los Angeles

418/419

Technical Appendix F

Employment Outlook for the Railroad Industry and for Related Counterpart Occupations

Primary Industry #11 SIC 40

Estimated Employment and Projected Employment Change, U.S. and California

	1965 EMPLOYMENT	PROJECTED EMPLOYMENT CHANGE 1965-75
U.S.	735,000	+ 12%
Calif.	49,800	INA

Summary of Employment Prospects:

U.S.: Employment requirements in the Railroad Transportation industry are expected to continue downward during the remainder of the 1960's and then begin to increase sometime in the early 1970's. By 1975, a level of 820,000 should be reached, in response to growth in freight activity. An upward trend in freight traffic should more than offset the effects of a continued decline in passenger service and will be the result of demand generated by high levels of economic activity anticipated for the next decade.

California: This state should experience further employment decline at least through 1970. If national employment patterns are followed, the downward trend in California railroad industry employment should reverse itself between 1970 and 1975. California, with very few, but relatively profitable railroads, now has less than seven percent of the nation's employment in this industry.

Effect of Defense Cutbacks:

Under the assumption of a 20 percent cutback in military efforts, with offset spending in the nondefense sector of the economy, railroad employment might benefit very slightly. This industry is ranked close to the neutral point in Leontief's table, so that if a cutback of this kind occurred, it is not likely to affect the outlook for the one validated occupation in this industry.5

Occupations for Which Transfer Potential Is Not Impaired by Labor Market Outlook:

None

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Employment Outlook in Counterpart Occupations with Job Opportunities Primarily in the Railroad Industry (SIC 40) P.I. #11

I	II	III	IV	V
D.O.T. CODE AND SUFFIX	OCCUPATIONAL TITLE	VOLUME	JOB OUTLOOK	AREAS OF PRINCIPAL JOB OPPORTUNITIES IN CALIFORNIA
845.381-010	RAILROAD-CAR LETTERER (r.r. trans.)		Poor	Prospects limited to a few replacements only.

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Employment Outlook for the Air Transport Industry and for Related Counterpart Occupations

Primary Industry #12 SIC 45

Estimated Employment and Projected Employment Change, U.S. and California

	1965 EMPLOYMENT	PROJECTED EMPLOYMENT CHANGE 1965-75
U.S.	230,000	+ 30%
Calif.	36,700	Rate of increase faster than U.S.

Summary of Employment Prospects:

U.S.: Employment requirements in air transportation are expected to increase rapidly between 1965 and 1975. Future employment growth is predicated on a rapid rise in passenger and cargo traffic. Technological change should be a significant limiting factor in employment growth through the mid-1970's. Many new developments such as automated air traffic control and all-weather landing systems will be built around computers and other sophisticated electronic equipment.

Increased employment will be accompanied by occupational change. Fewer engine overhaul mechanics will be needed to maintain the less complex and more reliable jet engines. Conversely, more airframe and systems mechanics will be required as a result of the increased complexity of the electronic, hydraulic, and other structural systems.

California: If the rate of increase continues at the pace of recent years, California, which already has 16 percent of the nation's air transport workers should enlarge its share by 1975.

Effect of Defense Cutbacks:

Should a 20 percent cutback in defense, with offset spending in the nondefense sector of the economy occur, employment in the Air Transport Industry would benefit very slightly. Leontief includes this industry with "other transportation", and places it not far from the neutral sector of his employment table.5

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Occupations for Which Transfer Potential Is Not Impaired by Labor Market Outlook:

All of the four counterpart occupations validated by employer questionnaire appear to present good prospects for skills transfer.

There will be volume opportunities for persons working in the defense-related occupation of COMPONENT TEST MECHANIC, SENIOR, to transfer skills to HYDRAULIC TESTER. In the event of defense cutbacks, good prospects would exist for limited numbers of INSTRUMENTATION SERVICEMAN "A" to transfer to this industry as INSTRUMENT MAN. Volume opportunities would exist for persons working in defense plants as ELECTRONICS TECHNICIAN "A" to transfer their skills to RADIO MECHANIC II. For the last of this group of jobs, MISSILE PAINTER, there would be ample opportunities for transfer to the occupation of PAINTER, AIRCRAFT in the Air Transport Industry.

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Employment Outlook in Counterpart Occupations with Job Opportunities Primarily in the Air Transport Industry (SIC 45) P.I. #12

I	II	III	IV	V
D.O.T. CODE AND SUFFIX	OCCUPATIONAL TITLE	VOLUME	JOB OUTLOOK	AREAS OF PRINCIPAL JOB OPPORTUNITIES IN CALIFORNIA
621.281-042	HYDRAULIC TESTER (aircraft mfg.; air trans.)	+	Good	Los Angeles, San Francisco
710.281-050	INSTRUMENT MAN (aircraft mfg.; air trans.)		Good	Los Angeles, San Francisco
823.281-030	RADIO MECHANIC II (any ind.)	+	Good	Los Angeles, San Francisco, San Diego
845.781-010	PAINTER, AIRCRAFT (aircraft mfg.; air trans.)	+	Good	Los Angeles, San Francisco, San Diego

Technical Appendix F

Employment Outlook for the Communications Industry and for Related Counterpart Occupations

Primary Industry #13 SIC 48

Estimated Employment and Projected Employment Change, U.S. and California

	1965 EMPLOYMENT	PROJECTED EMPLOYMENT CHANGE 1965-75
U.S.	880,400	No change
Calif.	114,000	Substantial increase over 1965

Summary of Employment Prospects:
U.S.: Over-the-decade projections indicate that total employment in the Communications Industry will remain close to the 1965 level.

Within the telephone industry, which in 1964 contained about 83 percent of all communications workers, there are offsetting trends. These are the increased demand for telephone services, coupled with labor-saving technological innovations. While the overall trend is for stable employment, there are continuing changes in the occupational structure of the industry. Employment of some occupational groups, such as installers and repairmen will increase, while the number of employees placing wire and cable will remain about the same.

California: Unlike national employment, indications are that employment for the Communications Industry in California will continue to increase. If present trends persist, employment should increase substantially by 1975. For the few occupations validated, the assumption of continued increase is verified by the responses to employer questionnaires.

Effect of Defense Cutbacks:
Leontief's input-output analysis does not specifically cover employment in the Communications Industry. Under the assumption of a 20 percent cutback in military activity with offset spending in the nondefense section of the economy the other public utilities industries in this division reflect a net positive effect.[5] From this standpoint it may

be inferred that the Communications Industry, whose growth is more nearly geared to expansion of population, will not be adversely affected by such cutbacks in defense spending.

Occupations for Which Transfer Potential Is Not Impaired by Labor Market Outlook:
In the event of defense cutbacks of the kind described above, there are good prospects for relatively large numbers of workers employed in defense plants as ELECTRICAL AND ELECTRONICS INSTALLER to transfer their skills to the occupations of CENTRAL-OFFICE INSTALLER; CABLE MAN; and FRAMEMAN.

Prospects for defense workers employed as INSPECTOR, ELECTRONIC ASSEMBLY, SENIOR to transfer their skills to INSTRUMENT SHOPMAN, a volume occupation in this industry, also exist.

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Employment Outlook in Counterpart Occupations with Job Opportunities Primarily in the Communications Industry (SIC 48) P.I. #13

I	II	III	IV	V
D.O.T. CODE AND SUFFIX	OCCUPATIONAL TITLE	VOLUME	JOB OUTLOOK	AREAS OF PRINCIPAL JOB OPPORTUNITIES IN CALIFORNIA
722.281-018	INSTRUMENT SHOPMAN (tel. & tel.)	+	Good	Los Angeles
822.381-018	CENTRAL-OFFICE INSTALLER (tel. & tel.)	+	Good	Los Angeles, San Jose
822.381-022	EQUIPMENT INSTALLER (tel. & tel.)		INA	INA
822.884-010	CABLE MAN (tel. & tel.)	+	Good	San Francisco Bay Area, Sacramento & San Joaquin Valley
822.884-014	FRAMEMAN (tel. & tel.)	+	Good	Los Angeles, Sacramento & San Joaquin Valley

Technical Appendix F

Employment Outlook for the Electric, Gas, and Sanitary Services and for Related Counterpart Occupations

Primary Industry #14 SIC 49

Estimated Employment and Projected Employment Change, U.S. and California

	1965 EMPLOYMENT*	PROJECTED EMPLOYMENT CHANGE 1965-75
U.S.	625,300	No change
Calif.	53,700	Substantial increase over 1965

* Employers in government-owned utilities not included in these figures.

Summary of Employment Prospects:

U.S.: Employment requirements in the Electric, Gas, and Sanitary Services major industry group are expected to remain at about 625,000 in 1975. Rising output per worker is expected to offset the very large increase anticipated in volume of services rendered.

Within the industry group, a small employment decline is expected in electric utilities, despite the predicted doubling of electric power capacity by 1975. Labor-saving technological innovations will more than offset the increase in generating capacity. Employment in gas utilities is expected to increase somewhat, mainly as the result of rapid gains in output, but technological developments will limit employment growth. Employment in combination utilities is expected to remain at about the 1964 level through 1975. Although rapid employment growth is expected in the four smaller industry groups combined, the total number of additional workers required will not be great.

With respect to volume occupations, more efficient power-producing units will be serviced by the same number of workers as at present. Skilled maintenance workers will increase their numbers, while equipment operators will decrease. Remote-controlled meter reading, and other computerized equipment will reduce volume jobs in the electric as well as the gas production industry.

California: Because both industrial and population growth rates here exceed those for the nation, overall employment in this industry is expected to increase.

Prospects for each of the individual occupations grouped in this primary industry and validated by California employers are summarized in the table on the following page.

Effect of Defense Cutbacks:
According to Leontief's input-output analysis, a 20 percent reduction in defense with offset spending in the nondefense sector would have a small but positive effect on employment in both the electric light and power, and in the gas utilities components of this industry.[5]

Occupations for Which Transfer Potential Is Not Impaired by Labor Market Outlook:
Of the occupations grouped within the Public Utilities Industry for which sample employers gave usable employment projections, only one appears to offer volume transfer opportunities for workers from defense industries. This is the occupation of GAS-MAIN FITTER a counterpart of the defense occupation ROCKET TEST TECHNICIAN A.

INSTRUMENTATION SERVICEMAN "A" was also found to have good prospects for transfer to such jobs as GAS-METER PROVER, GAS-METER REPAIRMAN, and WATER-METER REPAIRMAN. The volume of potential transfers is smaller for these occupations than for the occupation listed above.

In addition, a few employees working as CONTROL MAN in the defense plant studied, according to survey results, will have good prospects for transfer to such jobs as PUMP-STATION OPERATOR; WATER-TREATMENT-PLANT OPERATOR, or SEWAGE-PLANT OPERATOR.

The defense occupation of INSTRUMENTATION SERVICEMAN "A" was found to be much more vulnerable to layoff than that of ROCKET TEST TECHNICIAN. CONTROL MAN was found to be a very low volume job in this plant.

7

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Employment Outlook in Counterpart Occupations with Job Opportunities Primarily in the Electric, Gas, and Sanitary Services (SIC 49) P.I. #14

I	II	III	IV	V
D.O.T. CODE AND SUFFIX	OCCUPATIONAL TITLE	VOLUME	JOB OUTLOOK	AREAS OF PRINCIPAL JOB OPPORTUNITIES IN CALIFORNIA
710.281-026	GAS-METER PROVER (light, heat, & power)		Good	L.A., S.F.
710.281-030	GAS-METER REPAIRMAN (light, heat, & power)		Good	L.A., S.F., S.D.
710.281-042	INDUSTRIAL-GAS SERVICE-MAN (light, heat, & power)		Poor	Few job prospects anywhere
710.281-054	INSTRUMENT MECHANIC (light, heat, & power)		Fair	Few scattered openings
710.281-066	METER REPAIRMAN (any ind.)		Fair	Few scattered openings
710.281-074	TIN-CASE-METER REPAIRMAN (light, heat, & power)		Fair	More openings in the largest cities

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Employment Outlook in Counterpart Occupations with Job Opportunities Primarily in the Electric, Gas, and Sanitary Services (SIC 49) P.I. #14

I	II	III	IV	V
D.O.T. CODE AND SUFFIX	OCCUPATIONAL TITLE	VOLUME	JOB OUTLOOK	AREAS OF PRINCIPAL JOB OPPORTUNITIES IN CALIFORNIA
710-281-078	WATER-METER REPAIRMAN (waterworks)		Good	All metro areas
729.281-046	RELAY TESTER (light, heat & power)		INA	INA
824.381-012	STREET-LIGHT SERVICEMAN (light, heat & power)		Good	Scattered openings in most urban locations
862.381-026	GAS-MAIN FITTER (light, heat, & power)	+	Good	All metro areas
862.381-090	STEAM SERVICEMAN (light, heat, & power)		INA	INA
953.782-010	FUEL ATTENDANT (any ind.)		INA	INA

Technical Appendix F

Employment Outlook in Counterpart Occupations with Job Opportunities Primarily in the Electric, Gas, and Sanitary Services (SIC 49) P.I. #14

I	II	III	IV	V
D.O.T. CODE AND SUFFIX	OCCUPATIONAL TITLE	VOLUME	JOB OUTLOOK	AREAS OF PRINCIPAL JOB OPPORTUNITIES IN CALIFORNIA
953.782-018	GAS-PUMPING-STATION OPERATOR (light, heat, & power)		Poor	Few opportunities expected anywhere
954.782-014	PUMP-STATION OPERATOR WATERWORKS (waterworks)		Good	L.A. and other Southern Calif. municipalities
954.782-026	WATER-TREATMENT-PLANT OPERATOR (waterworks)		Good	L.A. and other Southern Calif. municipalities
955.782-018	SEWAGE-PLANT OPERATOR (sanitary serv.)		Good	Interior Valley and noncoastal Southern California

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Technical Appendix F

Employment Outlook for the Professional Equipment Distribution Industry and for Related Counterpart Occupations

Primary Industry #15 SIC 5086

Estimated Employment and Projected Employment Change, U.S. and California

See text for available figures on Current and Projected Employment

Summary of Employment Prospects:

U.S.: Figures on national employment and projections were not available for the relatively minor segment industry 5086.

California: Employers distributing X-ray equipment account for only a small proportion of the 5,500 persons employed in industry 5086, Professional Equipment and Supplies. Respondents to the sample, which included all of the larger California firms, employed about 250 persons. The estimated employment for the X-ray equipment distribution segment is very small, although the one counterpart occupation surveyed accounts for a relatively large proportion of employment in the industry.

Effect of Defense Cutbacks:

No figures are available which directly account for the effect of an assumed 20 percent cutback in defense spending on the X-ray equipment distribution industry.

Occupations for Which Transfer Potential Is Not Impaired by Labor Market Outlook:

Prospects are good for the transfer of skills from the defense-related occupation of INSPECTOR, ELECTRONIC SYSTEMS to the related occupation of X-RAY-EQUIPMENT TESTER. Sample respondents indicate a greater than twofold increase in employment over the forecast period. This is not a volume occupation, however, and it is doubtful that very many workers could be absorbed by such a small industry.

Technical Appendix F

Employment Outlook in Counterpart Occupations with Job Opportunities Primarily in the Professional Equipment Distribution Industry (SIC 5086) P.I. #15

I	II	III	IV	V
D.O.T. CODE AND SUFFIX	OCCUPATIONAL TITLE	VOLUME	JOB OUTLOOK	AREAS OF PRINCIPAL JOB OPPORTUNITIES IN CALIFORNIA
729.281-058	X-RAY-EQUIPMENT TESTER (any ind.)		Good	Los Angeles

Technical Appendix F

Employment Outlook for the Automobile Sales and Service Industry and for Related Counterpart Occupations

Primary Industry #16 SIC 55

Estimated Employment and Projected Employment Change, U.S. and California

	1965 EMPLOYMENT	PROJECTED EMPLOYMENT CHANGE 1965-75
U.S.	1,425,500	INA
Calif.	157,200	Substantial Increase

Summary of Employment Prospects:

U.S.: Information is not available for nationwide employment prospects in this industry. Employment requirements will be closely tied to the number of cars on the road, which by all indications, will increase considerably during the forecast period. Major labor saving from technological improvement is not likely without the widespread adoption of automobiles with revolutionary design.

California: If the upward trend of recent years continues, this industry's employment will increase substantially by 1975. California, which already has 11 percent of the nation's total auto sales and service employment, may increase its share during the forecast period because its population is growing at a more rapid rate than that of the nation.

Effect of Defense Cutbacks:

This industry is not directly considered in Leontief's input-output analysis study which is concerned with the effect on employment of a 20 percent cutback in defense with offset spending in the nondefense sector of the economy.[5] However, employment in automobile production would benefit in that event. Employment in automobile sales and service, which closely follows the trend in auto manufacturing, would almost certainly increase also.

Occupations for Which Transfer Potential Is Not Impaired by Labor Market Outlook:

In the event of defense cutbacks of the kind described, there would be opportunities for individuals working in defense plants as ASSEMBLER, GENERAL "A" to transfer their

skills to the volume job of AUTOMOBILE-ACCESSORIES INSTALLER. Cutbacks in defense spending would enhance slightly the labor market prospects for this counterpart occupation.

Technical Appendix F

Employment Outlook in Counterpart Occupations with Job Opportunities Primarily in the Automobile Sales and Service Industry (SIC 55) P.I. #16

I	II	III	IV	V
D.O.T. CODE AND SUFFIX	OCCUPATIONAL TITLE	VOLUME	JOB OUTLOOK	AREAS OF PRINCIPAL JOB OPPORTUNITIES IN CALIFORNIA
806.884-022	AUTOMOBILE-ACCESSORIES INSTALLER (auto. ser.)	+	Good	Los Angeles, San Francisco Bay Area, Orange & San Diego Counties
845.781-018	PAINTER, AUTOMOBILE (auto. ser.)		Poor	Los Angeles, San Francisco Bay Area, San Diego

Technical Appendix F

Employment Outlook for the Television and Radio Repair Industry and for Related Counterpart Occupations

Primary Industry #17 SIC 762

Estimated Employment and Projected Employment Change, U.S. and California

See text for available figures on Current and Projected Employment

Summary of Employment Prospects:

U.S.: The number of Television and Radio Service Technicians, the principal occupational group of this primary industry, is estimated at 115,000 as of early 1965. This figure includes all three of the counterpart occupations surveyed as well as clerical and managerial workers engaged in this industry. Employment is concentrated in the heavily populated states and major metropolitan areas.

Employment of Television and Radio Service Technicians is expected to increase rapidly during the 1965-75 decade. In addition, more than 1,400 job openings annually are expected to result from the need to replace experienced workers who retire or die. Transfers to other occupations by workers in the industry may provide additional job openings.

California: California employment in the Television and Radio Repair Industry includes 6,200 covered wage earners working for a total of 1,362 different California employers. Self-employment, estimated at one-third of the total, would increase this figure to about 9,000 for 1965. No reliable employment projections are available.

Effect of Defense Cutbacks:

Although Leontief does not have a separate category for this industry, it is included as part of the Professional and Services group. Under conditions of a 20 percent cutback in defense industries with offset spending in the nonmilitary sector of the economy, it can be inferred that employment in the Television and Radio Repairs Industry, like similar repair services, should benefit slightly.

Technical Appendix F

Occupations for Which Transfer Potential Is Not Impaired by Labor Market Outlook:

A relatively large volume of workers employed in defense-related industries as ELECTRONICS TECHNICIANS appears to have good prospects to transfer their skills to the occupation of TELEVISION SERVICE-AND-REPAIRMAN under assumed cutback conditions. There would also be limited opportunities for ELECTRONICS TECHNICIANS to transfer their skills to the nonvolume jobs of TAPE-RECORDER REPAIRMAN and RADIO REPAIRMAN. In many small shops, the same person may be called upon to perform the functions of all three of these occupations.

Technical Appendix F

Employment Outlook in Counterpart Occupations with Job Opportunities Primarily in the Television and Radio Repair Industry (SIC 762) P.I. #17

I	II	III	IV	V
D.O.T. CODE AND SUFFIX	OCCUPATIONAL TITLE	VOLUME	JOB OUTLOOK	AREAS OF PRINCIPAL JOB OPPORTUNITIES IN CALIFORNIA
720.281-018	TELEVISION SERVICE-AND-REPAIRMAN (any ind.)	+	Good	Los Angeles & San Francisco Bay Area
720.281-014	TAPE-RECORDER REPAIRMAN (any ind.)		Fair	A few job opportunities in largest cities.
720.281-010	RADIO REPAIRMAN (any ind.)		Fair	A few job opportunities in largest cities.

Technical Appendix F

Employment Outlook for the Motion Picture Studios Industry and for Related Counterpart Occupations

Primary Industry #18 SIC 781

Estimated Employment and Projected Employment Change, U.S. and California

	1965 EMPLOYMENT	PROJECTED EMPLOYMENT CHANGE 1965-75
U.S.	48,200	INA
Calif.	24,500	INA

Summary of Employment Prospects:

U.S.: Projections are not available for this industry. Employment trends are likely to resemble those of California, where many of the largest studios are located.

California: Reliable projections are not available for this industry because of the irregular fluctuations in employment over the last several years. In 1965, motion picture employment was nearly the same as 1959. Employers surveyed were reluctant to make any predictions about employment in the motion picture industry.

Effect of Defense Cutbacks:

Although no direct figures are available for this industry, Leontief's analysis rates the more inclusive category of restaurants, hotels, and amusements as one which would benefit from cutbacks.

Occupations for Which Transfer Potential Is Not Impaired by Labor Market Outlook:

No reliable projections are available for the occupation validated, that of ELECTRICIAN, STAGE. These workers are hired through the union, and employment by individual establishments follows no predictable pattern. Job opportunities are limited largely to the Los Angeles Area.

Technical Appendix F

Employment Outlook in Counterpart Occupations with Job Opportunities Primarily in the Motion Picture Studios Industry (SIC 781) P.I. #18

I	II	III	IV	V
D.O.T. CODE AND SUFFIX	OCCUPATIONAL TITLE	VOLUME	JOB OUTLOOK	AREAS OF PRINCIPAL JOB OPPORTUNITIES IN CALIFORNIA
824.381-010	ELECTRICIAN, STAGE (amuse. & rec.)	+	INA	Los Angeles

Technical Appendix G

EMPLOYMENT OUTLOOK FOR COUNTERPART OCCUPATIONS IN DEFENSE-ORIENTED INDUSTRIES

A good many of the occupations studied in the two aerospace plants have counterparts exclusively in industries which are likewise defense-oriented. These industries are likely, to varying degrees, to be adversely affected by cutbacks in defense spending. Under such circumstances, many of these occupations would offer few or at best uncertain skills transfer opportunities.

Workers in some of these occupations will require lengthy retraining, or be obliged to take jobs in which their existing skills cannot be immediately used.

This appendix includes a discussion of each of the five defense-oriented industries in which counterpart occupations were found. The discussion format is similar to that for the 18 nondefense industries in Technical Appendix F.

Employment Outlook Tables

Responding employers also gave information on the long-range employment prospects for counterpart occupations in each of these industries. Reduced military activity, with offset spending in nondefense sectors of the economy, would have a negative effect on employment in each of these industries.[5] For this reason, job outlook ratings of "indeterminate" were assigned, even for counterpart occupations about which respondents were consistently optimistic.

Technical Appendix G

Employment Outlook for the Electronics and Related Industries and for Related Counterpart Occupations

Primary Industry #20 Electronics SIC 36

Estimated Employment and Projected Employment Change, U.S. and California

	1965 EMPLOYMENT	PROJECTED EMPLOYMENT CHANGE 1965-75
U.S.	1,658,100	+ 21%
Calif.	195,000	Rate of increase faster than U.S.

Summary of Employment Prospects:

U.S.: Employment requirements in this major group are expected to increase very rapidly during the decade ahead. Despite the growing application of labor-saving devices and processes, it is estimated that about two million workers will be required by 1975 to meet the anticipated rapid growth in demand for the products of this major industry group.

Currently, about half of all workers in this major group (SIC 36) are employed in the three industry groups primarily engaged in manufacturing electronics products: communication equipment; electronic components; and radio and television sets. The remaining half are engaged in manufacturing electrical equipment.

Military space products comprised nearly half of this industry's total shipments during the period from 1958 - 64. The increased use of electrical machinery and controls by both industrial plants and consumers is expected to increase substantially over the next decade.

California: In 1961, Electrical Machinery, Equipment, and Supplies (SIC 36) replaced Aircraft and Parts Manufacturing (SIC 372) as the state's leading employer of durable goods workers. As of 1965, this number was rapidly approaching 200,000.

If the present rate of growth continues, by 1975 this major group will employ far more workers than any other sector of manufacturing. The most rapidly growing component of this industry group is Communication Equipment (SIC 366) which in 1965 accounted for nearly 100,000 workers in this state.

Effect of Defense Cutbacks:
Among the industries included in SIC 36, for Radio, Electronics Equipment, and Electrical Apparatus will sustain net losses under assumed cutback conditions.5 Although the loss rates are lower than for Ordnance, Aircraft and Shipbuilding, they are nonetheless significant. The net effect on the future of this industry is particularly difficult to assess. It does not seem likely, however, that 20 percent cuts in military spending, with offsets in the nondefense sector, would arrest its growth entirely.

Labor Market Outlook for Counterpart Occupations:
All occupations in this group are assumed vulnerable to cutbacks in military spending because of their association with a defense-oriented industry. For this reason, no ratings other than indeterminate or INA are being assigned for these occupations.

It is likely, however, that some skills transfer prospects will exist in California - even in the event of major cutbacks of the kind described - for the ten counterpart occupations listed as volume in the accompanying tables, at least.

Technical Appendix G

Employment Outlook in Counterpart Occupations with Job Opportunities Primarily in the Electronics and Related Industries (SIC 36) P.I. #20

I	II	III	IV	V
D.O.T. CODE AND SUFFIX	OCCUPATIONAL TITLE	VOLUME	JOB OUTLOOK	AREAS OF PRINCIPAL JOB OPPORTUNITIES IN CALIFORNIA
003.181-014	ELECTRONIC TECHNICIAN (profess. & kin.)	+	Indeter-minate	Los Angeles and San Jose Areas.
721.281-042	TESTER, MOTORS AND CONTROLS (elec. equip.)		Indeter-minate	Los Angeles and Orange County Areas.
722.281-010	INSPECTOR, SYSTEMS (electronics)	+	Indeter-minate	Los Angeles, Orange County, San Diego, and San Jose Areas.
726.281-014	ELECTRONICS ASSEMBLER, DEVELOPMENTAL (electronics)	+	Indeter-minate	Los Angeles, Orange, San Jose and San Francisco Bay Areas.
726.281-018	ELECTRONICS TECHNICIAN, AUTOMATED PROCESS * (electronics)		INA	INA
726.384-010	CALIBRATOR, RESISTORS (electronics)		INA	INA

Technical Appendix G

Employment Outlook in Counterpart Occupations with Job Opportunities Primarily in the Electronics and Related Industries (SIC 36) P.I. #20

I	II	III	IV	V
D.O.T. CODE AND SUFFIX	OCCUPATIONAL TITLE	VOLUME	JOB OUTLOOK	AREAS OF PRINCIPAL JOB OPPORTUNITIES IN CALIFORNIA
726.384-014	INSPECTOR, FINISHING (electronics)		Indeterminate	Los Angeles, Orange County, and San Jose Areas.
726.384-018	INSPECTOR, PRINTED CIRCUIT BOARDS (electronics)	+	Indeterminate	Los Angeles, Orange County, and San Jose Areas.
726.884-018	CABLE MAKER (elec. equip.; electronics)	+	Indeterminate	Los Angeles, San Diego, and San Francisco Bay Areas.
726.884-082	MODULE ASSEMBLER (electronics)	+	Indeterminate	Los Angeles, and San Diego Areas.
726.884-094	PRINTED-CIRCUIT ASSEMBLER (electronics)	+	Indeterminate	San Jose Area.
728.887-010	WIREWORKER (electronics)		INA	INA

Technical Appendix G

Employment Outlook in Counterpart Occupations with Job Opportunities Primarily in the Electronics and Related Industries (SIC 36) P.I. #20

I	II	III	IV	V
D.O.T. CODE AND SUFFIX	OCCUPATIONAL TITLE	VOLUME	JOB OUTLOOK	AREAS OF PRINCIPAL JOB OPPORTUNITIES IN CALIFORNIA
729.381-022	PRODUCTION REPAIRMAN (electronics)	+	Indeter-minate	Los Angeles, Orange County, and San Jose Areas.
729.381-030	TESTER, SYSTEMS (electronics)	+	Indeter-minate	Los Angeles, Orange, and San Jose Areas,
828.251-010	ELECTRONIC SALES AND SERVICE TECHNICIAN * (profess. & kin.)		INA	INA
828.281-022	ELECTRONICS MECHANIC (any ind.)	+	Indeter-minate	Los Angeles, Orange, and San Jose Areas,

* These two counterpart occupations are in the computer manufacturing industry (SIC 3571), grouped with occupations in SIC 36 because of their defense orientation.

Technical Appendix G

Employment Outlook for the Aircraft Manufacturing Industry and for Related Counterpart Occupations

Primary Industry #21 SIC 372

Estimated Employment and Projected Employment Change, U.S. and California

	1965 EMPLOYMENT	PROJECTED EMPLOYMENT CHANGE 1965-75
U.S.	625,200	- 8%
Calif.	166,100	Rate of decrease faster than U.S.

Summary of Employment Prospects:

U.S.: The downward trend of employment in aircraft manufacturing, appears to be leveling off, and little significant change is expected during the 1965 - 75 decade.

Major types of aircraft which may come into production during the 1965 - 75 decade, include the supersonic transport, a supersized cargo plane, and possibly a vertical lift carrier. Research, development and testing of manned aircraft seems likely to increase in the next few years.

California: This state accounts for about one-third of the nation's aerospace jobs. A major portion of these are concentrated in California's aircraft and parts manufacturing industry. In 1965, there was a slight upturn in aircraft manufacturing employment to a level of 166,100. This is in contrast to the sharp decline which began in 1958. In California, aircraft manufacturing is now replaced by electrical machinery and equipment as the state's leading manufacturing industry. The Los Angeles - Long Beach area continues to dominate the state with nearly three-fourths of the aircraft employment centered there. San Diego, the only other area with numerically significant employment, accounts for approximately 15 percent, with the remainder scattered through other areas. This industry includes a number of companies which manufacture components for space vehicles rather than conventional aircraft.

Technical Appendix G

Effect of Defense Cutbacks:
Aircraft manufacturing is one of the industries which would be most severely affected by defense cutbacks. In this industry, Leontief projects nearly an 18 percent loss in employment under conditions of a 20 percent cut in defense, with offset spending in the nondefense sector of the economy.5 In California, where the recent decline in employment appears to have halted for the time being, a defense cutback would probably have a severe effect on substantially all the occupations found primarily in this industry.

Labor Market Outlook for Counterpart Occupations:
Defense cutbacks of the kind postulated would likely have a severe affect on employment in counterpart occupations found primarily in aircraft manufacturing. Despite the optimism of some employers who were surveyed, no ratings other than indeterminate or INA were assigned to these occupations, on this account.

Technical Appendix G

Employment Outlook in Counterpart Occupations with Job Opportunities Primarily in the Aircraft Manufacturing Industry (SIC 372) P.I. #21

I	II	III	IV	V
D.O.T. CODE AND SUFFIX	OCCUPATIONAL TITLE	VOLUME	JOB OUTLOOK	AREAS OF PRINCIPAL JOB OPPORTUNITIES IN CALIFORNIA
020.188-062	WEIGHT ANALYST, AIRCRAFT (aircraft mfg.)		INA	Los Angeles and San Diego Areas.
199.381-010	RADIOGRAPHER (any ind.)		Indeter-minate	Los Angeles, San Diego.
505.782-018	METAL SPRAYING MACHINE OPERATOR, AUTOMATIC (any ind.)		INA	INA
505.884-022	METAL SPRAYER, PRODUCTION (any ind.)		INA	INA
621.381-022	PNEUMATIC TESTER AND MECHANIC (aircraft mfg.)	+	Indeter-minate	Los Angeles Area.
661.380-010	MODEL MAKER, WOOD (any ind.)		Indeter-minate	Los Angeles and San Diego Areas.

Technical Appendix G

Employment Outlook in Counterpart Occupations with Job Opportunities Primarily in the Aircraft Manufacturing Industry (SIC 372) P.I. #21

I	II	III	IV	V
D.O.T. CODE AND SUFFIX	OCCUPATIONAL TITLE	VOLUME	JOB OUTLOOK	AREAS OF PRINCIPAL JOB OPPORTUNITIES IN CALIFORNIA
693.280-014	EXPERIMENTAL-AIRCRAFT MECHANIC (aircraft mfg.)		INA	Los Angeles and San Diego Areas.
693.381-010	LOFTSMAN (aircraft mfg.)		INA	INA
693.381-014	MOCK-UP MAN (aircraft mfg.)		INA	Los Angeles and San Diego Areas.
706.781-018	PRECISION ASSEMBLER, BENCH (aircraft mfg.)	+	Indeter-minate	Los Angeles, Orange and San Diego Areas.
726.281-010	ELECTRICIAN, RESEARCH (aircraft mfg.)		Indeter-minate	Los Angeles and San Diego Areas.
726.281-022	ENGINEERING DEVELOPMENT TECHNICIAN (aircraft mfg.)		Indeter-minate	Los Angeles, Orange and San Diego Areas.
729.381-010	ELECTRICAL EQUIPMENT TESTER (aircraft mfg.)		Indeter-minate	Los Angeles Area.

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Technical Appendix G

Employment Outlook in Counterpart Occupations with Job Opportunities Primarily in the Aircraft Manufacturing Industry (SIC 372) P.I. #21

I	II	III	IV	V
D.O.T. CODE AND SUFFIX	OCCUPATIONAL TITLE	VOLUME	JOB OUTLOOK	AREAS OF PRINCIPAL JOB OPPORTUNITIES IN CALIFORNIA
801.381-018	AIRCRAFT MECHANIC, RIGGING AND CONTROLS (aircraft mfg.)	+	Indeter-minate	Los Angeles.
806.381-010	ASSEMBLER, AIRCRAFT STRUCTURES AND SURFACE (aircraft mfg.)	+	Indeter-minate	Los Angeles, San Diego.
806.381-018	ASSEMBLY MECHANIC, EXPERIMENTAL AIRCRAFT (aircraft mfg.)	+	INA	Los Angeles and San Diego Areas.
806.381-026	INSPECTOR, ASSEMBLIES AND INSTALLATIONS (aircraft mfg.)	+	Indeter-minate	Los Angeles, San Diego.
806.381-054	TESTER, PLUMBING SYSTEMS (aircraft mfg.)		Indeter-minate	INA
806.781-014	ASSEMBLER-INSTALLER, GENERAL (aircraft mfg.)	+	Indeter-minate	Los Angeles, San Diego.

Technical Appendix G

Employment Outlook in Counterpart Occupations with Job Opportunities Primarily in the Aircraft Manufacturing Industry (SIC 372) P.I. #21

I	II	III	IV	V
D.O.T. CODE AND SUFFIX	OCCUPATIONAL TITLE	VOLUME	JOB OUTLOOK	AREAS OF PRINCIPAL JOB OPPORTUNITIES IN CALIFORNIA
806.781-022	BENCH MECHANIC, STEEL WELD (aircraft mfg.)	+	Indeter-minate	Los Angeles and San Diego Areas.
806.884-094	PRESSURE SEALER-AND-TESTER (aircraft mfg.)		Indeter-minate	Los Angeles and San Diego Areas.

Technical Appendix G

Employment Outlook for the Ship and Boat Building Industry and for Related Counterpart Occupations

Primary Industry #22 SIC 373

Estimated Employment and Projected Employment Change, U.S. and California

	1965 EMPLOYMENT	PROJECTED EMPLOYMENT CHANGE 1965-75
U.S.	159,000	INA
Calif.	10,300	INA

Summary of Employment Prospects:
U.S.: Shipbuilding is a defense-related industry which is highly cyclical in nature. Predicting 1975 employment in the industry is fraught with many hazards and no published projections were available. Employment trends in this industry have been downward, and dropped most rapidly immediately after World War II.

California: In California, shipbuilding has dwindled from a wartime high of more than 300,000 workers in 1943, to a 1965 average of only 10,000 workers, excluding employment in Government shipyards.

Effect of Defense Cutbacks:
Employment in shipbuilding would be severely curtailed in the event of a 20 percent cutback in military endeavor, although accompanied by offset spending in the civilian sector of the economy. Leontief in his input-output analysis, ranks this industry among those which would be most severely curtailed, should this degree of disarmament occur.5

Labor Market Outlook for Counterpart Occupations:
Two of the three occupations found primarily in ship and boat building are more characteristic of small craft manufacturing and sales, than of shipbuilding and repair.

Although all three were given indeterminate outlook ratings because of uncertain outlook in the industry, sample respondents were uniformly optimistic as to the employment prospects of workers in the occupations of BOAT OUTFITTER and BOAT RIGGER.

Technical Appendix G

Employment Outlook in Counterpart Occupations with Job Opportunities Primarily in the Ship and Boat Building Industry (SIC 373) P.I. #22

I	II	III	IV	V
D.O.T. CODE AND SUFFIX	OCCUPATIONAL TITLE	VOLUME	JOB OUTLOOK	AREAS OF PRINCIPAL JOB OPPORTUNITIES IN CALIFORNIA
806.281-026	HULL INSPECTOR (ship & boat bldg. & rep.)		Indeter-minate	Los Angeles, San Diego, San Francisco Bay Area.
806.884-030	BOAT OUTFITTER (ship & boat bldg. & rep.)		Indeter-minate	Los Angeles, Orange County Areas.
806.884-034	BOAT RIGGER (ret. tr.)		Indeter-minate	Orange, San Diego, and San Jose Areas.

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Technical Appendix G

Employment Outlook for the Instruments Industry and for Related Counterpart Occupations

Primary Industry #23 SIC 38

Estimated Employment and Projected Employment Change, U.S. and California

	1965 EMPLOYMENT	PROJECTED EMPLOYMENT CHANGE 1965-75
U.S.	387,000	+ 32%
Calif.	28,600	Rate of increase faster than U.S.

Summary of Employment Prospects:

U.S.: Employment requirements in the instruments and allied products major industry group are expected to increase rapidly between 1965 and 1975. The growing application of labor-saving technological innovations is expected partially to offset the anticipated rapid increase in production volume, and limit somewhat the growth in labor requirements.

At the present time, about half the workers in instrument manufacturing are engaged in fabricating scientific and related instruments, and an additional 20 percent in making photographic supplies. The remaining workers are concerned with producing medical and dental instruments, ophthalmic goods, and watches and clocks.

California: Currently a mere seven percent of the nationwide employment in this industry is located here. Its rate of growth, however, exceeds that of the United States, so that California's proportionate share is increasing.

Effect of Defense Cutbacks:

Leontief's input-output analysis indicates that a 20 percent cutback in military outlays with offset spending in civilian enterprise would result in a less than three percent cutback of employment in instrument manufacturing.[5] Should such cutbacks occur, it is likely that growth of the industry in California would be slowed, but not eliminated entirely.

Technical Appendix G

Labor Market Outlook for Counterpart Occupations:
Defense cutbacks would likely have an adverse effect on employment prospects for all occupations in this industry. Prospects for each of the four counterpart occupations in industry group are therefore rated as indeterminate, despite the fact that sample respondents were uniformly optimistic regarding employment outlook.

Of the occupations validated, only ELECTRONICS ASSEMBLER is classed as a volume occupation, according to information provided by survey respondents.

Technical Appendix G

Employment Outlook in Counterpart Occupations with Job Opportunities Primarily in the Instruments Industry (SIC 38) P.I. #23

I	II	III	IV	V
D.O.T. CODE AND SUFFIX	OCCUPATIONAL TITLE	VOLUME	JOB OUTLOOK	AREAS OF PRINCIPAL JOB OPPORTUNITIES IN CALIFORNIA
710.281-014	ELECTRICAL INSPECTOR (inst. & app.)		Indeter-minate	San Jose, San Diego and Orange County Areas.
710.281-018	ELECTROMECHANICAL TECHNICIAN (inst. & app.)		Indeter-minate	San Francisco Bay Area, San Diego Area.
710.281-022	ELECTRONIC-SCALE ASSEMBLER AND TESTER (bal. & scales)		Indeter-minate	San Jose, Los Angeles, and Orange County Areas.
726.884-066	ELECTRONICS ASSEMBLER (inst. & app.)	+	Indeter-minate	San Jose, Los Angeles, and San Diego.

Technical Appendix G

Employment Outlook for the Research Industry and for Related Counterpart Occupations

Primary Industry #24 SIC 7391;892

Estimated Employment and Projected Employment Change, U.S. and California

	1965 EMPLOYMENT*	PROJECTED EMPLOYMENT CHANGE 1965-75
U.S.	267,000	INA
Calif.	33,000	See text

Summary of Employment Prospects:

U.S.: * Published figures are available only for the nonprofit sector (SIC 892) of this industry. The 1965 figure for employment in the commercial sector (SIC 7391) is a judgment estimate. Published projections are not available. Based on past performance, it can be inferred that the employment figure for these industries will continue to increase at a relatively rapid rate.

California: This state, where many of the largest research firms were organized less than a decade ago, has a significant proportion of this work force committed to defense-related research projects. Employers surveyed included firms employing 8 out of every 10 research industry workers. Approximately one-half the workers in the profit sector of research (SIC 7391) are in defense-oriented firms, while three-fourths of the nonprofit segment (SIC 892) are similarly oriented.

If the rate of growth continues at its present rate, employment in this industry will more than double by 1975.

Effect of Defense Cutbacks:

Cutbacks in defense spending of the kind postulated by Leontief's input-output analysis would have a pronounced adverse effect on the labor market prospects for the research industry, and probably for most occupations composing it, as well.

This negative effect on the California economy would be further accentuated by virtue of the fact that substantial numbers of workers in the three occupations analyzed are also employed as civilians in military establishments here.

Labor Market Outlook for Counterpart Occupations:
Because of the substantial defense orientation of the research industry in California, employment prospects for the three validated counterpart occupations primarily found in this industry must be rated as indeterminate. Survey respondents, however, were optimistic regarding the labor market outlook for all three of these volume occupations.

Technical Appendix G

Employment Outlook in Counterpart Occupations with Job Opportunities Primarily in the Research Industry (SIC 7391;892) P.I. #24

I	II	III	IV	V
D.O.T. CODE AND SUFFIX	OCCUPATIONAL TITLE	VOLUME	JOB OUTLOOK	AREAS OF PRINCIPAL JOB OPPORTUNITIES IN CALIFORNIA
020.088-022	OPERATIONS RESEARCH ANALYST (profess. & kin.)	+	Indeter-minate	San Francisco Bay Area, San Jose, Los Angeles, Orange & Santa Barbara Counties.
020.188-022	MATHEMATICAL TECHNICIAN (profess. & kin.)	+	Indeter-minate	San Francisco Bay Area, San Jose, Los Angeles, Orange County.
020.188-030	PROGRAMMER, ENGINEERING & SCIENTIFIC (profess. & kin.)	+	Indeter-minate	San Francisco Bay Area, San Jose, Los Angeles, Orange & Santa Barbara Counties.

Technical Appendix H

DEFENSE-ORIENTED EMPLOYMENT, U. S. AND CALIFORNIA, 1965

The defense-oriented industries in the accompanying table are predominantly those identified by the Department of Commerce in the Census of Manufactures publication Shipments of Defense-Oriented Industries.[47] Although this standard reference takes into consideration both manufacturing and nonmanufacturing industries, appropriate employment figures are not shown for the latter. In addition to the manufacturing industries named by the Department of Commerce publication; Research and Development, and Department of Defense civilian employment are termed defense-oriented in the usage of this report.

The Census of Manufactures' concept of defense-oriented industries should not be confused with the term primary industries as defined elsewhere in this study.

The following table compares employment in California and nationwide employment and defense-oriented industries. It shows how important segments of defense-oriented industries are concentrated in California. The most significant of these are: Aerospace (SIC 372 and 1925); Communication equipment (SIC 366); Electronic components and accessories (SIC 367); Research and development (SIC 7391 and 892); and Department of Defense civilian employment (SIC 93xx). For each of these industries, California's share of the national total exceeds its nine percent overall equity in nonagricultural employment nationwide.

Notably, California lags behind the nation as a whole in two defense-oriented industries -- Nonelectrical machinery, and Ship building and repair.

The total employment of each industry is recorded here, disregarding the fact that varying proportions of employees are working exclusively on defense contracts. An adjustment for the fraction of employees engaged in defense projects would affect California and U.S. figures alike and would not significantly change California's share of defense-oriented employment.[47] A later (1965) edition of the Census of Manufactures, published after the data for this report were organized, contains a more inclusive list of defense-oriented industries.

Technical Appendix H

DEFENSE-ORIENTED EMPLOYMENT,
U. S. AND CALIFORNIA, 1965

I	II	III	IV
Industry	1965 Average Employment		California as Proportion of Total U.S.
	U.S.	California	
Total, Non-Agricultural Employment	60,770,000	5,772,000	9%
Total Defense-Oriented	4,043,600	652,600	16%
Selected Machinery (SIC 3511, 3531, 3542, 3571)	839,400	53,000	6%
Communication Equipment (SIC 366)	416,800	97,600	23%
Electronic Components and Accessories (SIC 367)	304,900	37,300	12%
Aerospace Industries (SIC 372, 1925)	797,900	254,800	32%
Shipbuilding and Repairing, and Ordnance (SIC 3731, SIC 19 - except 1925)	212,100	12,700	6%
Selected Instruments (SIC 3811, 38211, 38216, 3831, 3861)	266,700	24,400	9%
Research and Development (SIC 7391, 8921)	267,000	33,000	12%
Federal, Department of Defense Civilian (SIC 91xx)	938,800	139,800	15%

(Footnotes are on following page)

Technical Appendix H

(Footnotes)

Sources (See Bibliography for complete references):

1. List of defense-oriented industries: 1963 Census of Manufactures Shipments of Defense-Oriented Industries[47]

2. Employment, U. S.: Employees in Non-Agricultural Establishments, By Industry[17]; and, Employment and Earnings and Monthly Report on the Labor Force.[18]

3. Employment, California: Estimated Number of Wage and Salary Workers In Non-Agricultural Establishments, By Industry California 1939...1966[23]; and, California Employment and Payrolls Oct-Dec. 1965.[12]

4. R & D employment for U. S. is estimated from incomplete figures reported in Employees in Non-Agricultural Establishments, By Industry[17]; and, California figures as reported in Department of Employment, Report 127 (unpublished listings).

Technical Appendix I

SIC CODES OF SURVEYED EMPLOYERS GROUPED WITH RELATED PRIMARY INDUSTRIES

The following table gives the four-digit codes of industries containing the counterpart occupations surveyed in this study and shows how they relate to "primary industries" whose prospects are described in Appendix F. One or more employers in each of the four-digit SIC codes shown in this table participated in the survey.

A principal advantage of the primary industry arrangement is that it relates all surveyed employers to 23 homogeneous categories, for which there is relative abundance of labor market information. It would have been difficult, if not impossible, to treat each of 104 four-digit industries in this study individually, as little published information about them exists.

These primary industries constitute some of the better known, dynamic elements of this state's rapidly developing economy and provide a suitable framework for the discussion of surveyed occupations.

See Technical Appendix J for a more extensive description of sampling procedures.

Technical Appendix I

SIC CODES OF SURVEYED EMPLOYERS
GROUPED WITH RELATED PRIMARY INDUSTRIES

Part a. Nondefense Industries

I	II	III	IV
Primary Industry Number	Primary Industry Title	SIC	Four-Digit Codes of Employers Surveyed
1	Construction	15,16,17	1511,1611,1621,1731,3273
2	Furniture and Fixtures	25	2433,2499,2511,2531
3	Chemicals	28	2813,2818,2819,2821,2822,2834, 2841,2851,2871,2872,5969
4	Petroleum	29	1311,1381,1511,2911,3533,4613
5	Rubber	30	3069
6	Fabricated Metals	34	3429,3433,3441,3442,3443,3444, 3449,3461,3585
7	Machinery, except electrical	35	
	7A Diesel Engines		2420,3519,3732
	7B Farm Equipment		3522
	7D Machine Shops		3443,3451,3452,3461,3519,3530, 3540,3541,3544,3545,3553,3559, 3566,3569
8	Motor Vehicles	371	3711,3712,3713,3715
9	Trailer Coach	3791	3715,3791
10	Electric Sign Manufacturing	3993	3993

Technical Appendix I

SIC CODES OF SURVEYED EMPLOYERS
GROUPED WITH RELATED PRIMARY INDUSTRIES

Part a. Nondefense Industries

I	II	III	IV
Primary Industry			Four-Digit Codes
Number	Title	SIC	of Employers Surveyed
11	Railroad	40	4011
12	Air Transport	45	4511
13	Communications	48	3542,4143,4811
14	Electric, Gas, and Sanitary Services	49	4811,4911,4924,4931,4932,4941, 9341,9349,9390
15	Professional Equipment Distribution	5086	2899,3693,5086
16	Automobile Sales and Service	55	5511,7531,7535
17	Television and Radio Repair	762	5064,7621
18	Motion Picture Studios	781	7811

Technical Appendix I

SIC CODES OF SURVEYED EMPLOYERS
GROUPED WITH RELATED PRIMARY INDUSTRIES

Part b. Defense-Oriented Industries

I	II	III	IV
Primary Industry			Four-Digit Codes
Number	Title	SIC	of Employers Surveyed
20	Electronics (Sampling includes computer manufacturers)	36	3571,3611,3612,3621,3651,3661, 3662,3673,3674,3679,3693
21	Aircraft	372	3721,3722,3729
22	Ship & Boat Building	373	3731,3732,5599,9137
23	Instruments	38	3611,3811,3821,3822,4811
24	Research	89	7391,8221,8921,9137,9189,9190, 9282,9290

Technical Appendix J

DEVELOPING FIELD DATA

It became evident early in the project that existing data would not yield all of the information required to satisfy terms of the contract. At that time it was decided that the most direct method of obtaining timely, comparable data would be to conduct a mail survey of California employers deemed likely to employ persons representing counterpart occupations which had been subjected to job analysis.

Besides questions about the relevance of defense-related skills, the validation survey asked for current and projected employment, wages, and retraining information.

1. Sampling

In order to identify employers most likely to hire people in the detailed occupations studied it was necessary to apply judgmental criteria. This ruled out the use of probability sampling.

In order to focus attention on the labor market sector most likely to include counterpart occupations, it was necessary to identify these occupations in terms of industry. Fortunately, the D.O.T. job title, together with its industry designation, often gives a specific indication of industries in which employment for a given occupation is concentrated. This, then, was the starting point for choosing the sample.

Employers were selected from four different sources. The first category consisted of employers reporting to California Department of Employment in connection with their unemployment insurance tax obligation. These are listed in Department records by county, by industry, and by size of firm. The second source was composed of employers submitting data for ES-219 reports prepared by Labor Market Analysts. These employers are significant contributors to the employed labor force in each of the State's principal labor market areas, and are the basis for the labor market employment estimates and projections for each area. A third source was the California Manufacturers' Register. There were certain

industries in which the sample was still deficient. In this case, additional employers were identified from classified telephone directories.

The next step involved selecting the largest employers in each industry for which counterpart jobs were to be validated. This maximizes the probability of reaching employers who had the appropriate workers on their payrolls.

2. Selection of Counterpart Occupations

The 35 defense jobs selected for validation were broadly representative of all those analyzed, amounting to about one-third of the total. Twenty-six defense-related occupations in plant one were surveyed, and an additional nine defense-related occupations were surveyed in plant two. The total of 126 different surveyed occupations were among those discovered by occupational analysis to be the nondefense counterparts of these 26 occupations.

Altogether, 2,060 questionnaires were mailed to 665 employers during the first quarter of 1967. These firms employed an estimated 784,000 workers. Sample employment by industry is shown in the accompanying table. Although plant one defense jobs were more extensively sampled, for some industries, the sample was limited to a few employers for each of the nondefense-related jobs. Frequently however, all the principal employers for a particular industry were included in the mail survey.

With rare exceptions, the number of different questionnaires sent to a particular employer was limited to five. This was done for the practical reason that more than five questionnaires would not conveniently fit in the return envelope supplied the employer. As it turned out, the response rate was higher for employers who received only one or two different questionnaires than for those who received the maximum.

In plant two, each of the defense occupations selected for validation represented an important volume occupation in that plant. This part of the sample actually represented a larger number of workers in defense jobs than the much more extensive validation effort in plant one. Larger numbers of employers received questionnaires for each plant two occupational combination.

This mail sample represents a substantial proportion of the total employment for the 23 primary industries in

which nondefense occupations were found (see accompanying table). Although it lacks the precision of a probability sample it has the merit of including the most likely employing units. This is borne out by the results of the survey. The majority of sample employers responded affirmatively about their use of occupations for which validation information was sought.

3. Sample Followups

Six to eight weeks after the initial bulk mailing, second notices were sent to each employer who had not yet responded to the initial request for information. In addition, certain key employers were called on the telephone. By the use of followups, the response rate was increased from about 50 percent to 80 percent of all employers sampled.

4. Sample Returns

From the total of 2,060 questionnaires sent out, 1568 replies were received up to May 31, 1967. This is a return of 76 percent on our mail sample. Any returns received since June 1, were not included in the occupation-by-occupation evaluation.

Of the 665 employers who received questionnaires, 530, or 80 percent returned the questionnaires as requested. The rate of return for employers, which is slightly higher than the rate of return for questionnaires, reflects the higher response rate of employers who were sent only one or two questionnaires.

5. Design of Questionnaire

A facsimile of the Confidential Employer Validation Questionnaire is included at the end of this technical appendix. The questionnaire package included a single page letter which explains the purpose of the survey. To this letter were attached from one to five individual sheets containing questions about the specific nondefense occupations tentatively associated with the employer. On the address side of each questionnaire are two job descriptions. At the left is a description of the defense-related occupation and on the right side is the job description of a counterpart occupation. The reverse side of the questionnaire contains six indivi-

dual questions to be answered by the employer only if he has on his payroll any workers in the nondefense-related occupation described in the right hand column on the face of the questionnaire.

The first two questions are to elicit validation of the job analysis findings. The third question is concerned with training requirements. The fourth calls for a total employment figure and serves as a check against the information in other Department records. The fifth question is concerned with current and forecast employment for the occupation. The final question is on wages for the counterpart occupation.

6. Field Testing

As soon as the design of the questionnaire had been agreed upon, one defense occupation and several of its nondefense counterparts were identified for a field test. The appropriate forms were sent to several large employers in the electric, gas and sanitary services industry. The initial response to this was slow but eventually all but one of the employers returned the questionnaire as requested. The quality of the response exceeded our expectations, and as soon as clearance for the mass mailing was obtained, questionnaires were dispatched.

7. Value of Data Received

For most of the nondefense jobs validated, a qualitative judgment was made, based on the response to each of the questions asked. Data from employers who obviously misinterpreted the questions were discarded.

Perhaps the most significant shortcoming of the sampling method chosen is the limited information obtained from employers who are not in a primary industry. For example, employers of electricians were sampled in the construction industry but not in manufacturing. Had this survey attempted to account for all of the job opportunities in counterpart occupation, our resources would have limited the survey to perhaps no more than four or five such occupations. This would not have met the objective of the survey, which was to validate a representative sample of the occupations analyzed.

The questionnaire was multi-purpose, so that an employer was first asked to validate the job analysis, and then his judgment on other matters was requested.

This field survey was not designed to obtain the complex labor market projections which are developed for area skill surveys, for example. Obtaining detailed information of this type would have required personal interviews with large numbers of employers, far too costly a technique for the resources allocated.

Complex or difficult questions, such as determining the number of workers needed for job replacement, were avoided. Such information can only be inferred from the replies received. The sample was limited to a relatively few employers for each occupation validated. Since it is not a probability sample there is no imputed population to which sample responses can be inflated. Total California employment for these detailed counterpart occupations has not been derived or expressed in quantitative terms.

8. Job Outlook Rating Procedure

As to the actual mechanics of the rating procedure: First, responses for each validated nondefense occupation were summarized. In cases where employment information given in answer to question 5 was obviously incorrect, the data were discarded. In other cases, when employers gave answers which applied equally to two or even three occupations, the data were allocated to each of the occupations. Employers who refrained from making forecasts were treated as expecting neither an increase nor a decrease in occupational population for the two projected years.

Frequently, questionnaire respondents accounted for a major proportion of total employment in their industry.

Technical Appendix J

Estimated Employment of Firms in Validation Survey
Compared With Average 1965 Wage and Salary Employment for California

I	II	III	IV	V	VI
PRIMARY INDUSTRY		EMPLOYMENT			
			Validation Survey		
Number	Title	Total Wage & Salary	Primary Industry	Related * Industries	%, IV/III
Total	All Industries	1,592,200	654,400	129,300	41
Total	Nondefense Industries	1,159,200	288,900	47,800	25
1	Construction (15,16,17)	323,700	10,000	1,000	3
2	Furniture & Fixtures (25)	32,600	2,800	600	9
3	Chemicals (23)	47,000	11,700	500	25
4	Petroleum (29)	28,400	24,300	1,300	86
5	Rubber (30)	28,000	4,400	-	16
6	Fabricated Metals (34)	99,300	10,900	-	11
7	Machinery, except electrical (35)	103,500	35,200	14,500	34
8	Motor Vehicles (371)	35,000	26,300	-	75
9	Trailer Coach (3791)	7,700	2,500	300	32

504/505

Technical Appendix J

Estimated Employment of Firms in Validation Survey
Compared With Average 1965 Wage and Salary Employment for California

I	II	III	IV	V	VI
PRIMARY INDUSTRY		EMPLOYMENT			
			Validation Survey		
Number	Title	Total Wage & Salary	Primary Industry	Related * Industries	%, IV/III
10	Electric Signs (3993)	3,600	900	-	25
11	Railroads (40)	49,800	4,000	-	8
12	Air Transport (45)	36,700	32,200	-	88
13	Communications (48)	114,000	74,900	-	66
14	Electric, Gas & Sanitary Services (49)	53,700	27,700	29,500	52
15	Professional Equipment Distribution (5086)	5,500	700	-	13
16	Automobile Sales & Service (55)	157,200	2,900	-	2
17	Television & Radio Repair (762)	9,000	1,500	100	17
18	Motion Picture Studios (781)	24,500	16,000	-	65

569/507

Technical Appendix J

Estimated Employment of Firms in Validation Survey
Compared With Average 1965 Wage and Salary Employment for California

I	II	III	IV	V	VI
PRIMARY INDUSTRY		EMPLOYMENT			
			Validation Survey		
Number	Title	Total Wage & Salary	Primary Industry	Related * Industries	%, IV/III
Total	Defense-Oriented Industries	433,000	365,500	81,500	84
20	Electronics (36)	195,000	163,800	-	84
21	Aircraft (372)	166,100	151,500	-	91
22	Ship & Boat Building (373)	10,300	8,800	15,300	85
23	Instruments (38)	28,600	15,500	-	51
24	Research (7391,892)	33,000	26,900	66,200	82

* Most of the related industries employment is in municipal, state, or federal government agencies.

Total estimated sample employment is 783,700 (sum of columns IV and V, top line of this table).

Sources of Data (See Bibliography for complete reference):
Two and three digit industries:
Total Wage & Salary Employment: Estimated Number of Wage and Salary Workers in Nonagricultural Establishments, by Industry, California 1939...1966.[23]
Four digit industries: California Employment and Payrolls.[12]
The remaining figures are developed from sample work papers.

508/605

STATE OF CALIFORNIA — RONALD REAGAN, *Governor*

CALIFORNIA STATE EMPLOYMENT SERVICE

SACRAMENTO 95814

REFER TO:

The California Department of Employment needs your help in conducting a study of selected occupations in defense industry in order to determine their similarity to occupations in other industries. The long range objective of this study is to obtain information which will assist in an orderly economic adjustment in the event of future reductions in defense activities.

We are interested in learning whether or not a person performing the duties described in Column 1 of the attached form(s) would be able to perform the duties described in Column 2. We ask that you assist us by filling out the enclosed form(s) that describe in Column 2 occupations in your organization.

The information which you furnish us will be used for research purposes only, and your firm will not be identified in the final report. Your response does not, in any way, imply a commitment to consider any individual for employment, and your reply will be held in strict confidence.

Please use the enclosed, self-addressed envelope to return the completed form(s).

ALBERT B. TIEBURG
ASSISTANT DIRECTOR-MANPOWER

HIRE THROUGH CALIFORNIA STATE EMPLOYMENT SERVICE

Public Employment Service
SERVICE FOR EVERYONE
LOCAL · STATE · NATIONAL

510/511

STATE OF CALIFORNIA

800 CAPITOL MALL
SACRAMENTO, CALIFORNIA 95814

DEPARTMENT OF EMPLOYMENT

REFER TO

BUDGET BUREAU NO. 102-66002
APPROVAL EXPIRES 6/30/67

CONFIDENTIAL EMPLOYER VALIDATION QUESTIONNAIRE

Please read the job description given below in Column 2. Give primary consideration to job duties.
THE TITLES USED HERE MAY NOT BE THE SAME AS THE TITLE USED BY YOUR FIRM FOR THIS JOB.
If you now employ or have employed any workers performing these duties, please answer the questions on the reverse side of this form. If you do not employ or have not employed such workers, proceed to other attached forms and complete as appropriate. Please return all forms to us.

COLUMN 1	COLUMN 2
DEFENSE OCCUPATION Title and Code	**NON-DEFENSE OCCUPATION** D.O.T. Title, Code, and Description

1. If you had a vacancy for the job described in Column 2, could you fill it with someone who was performing the job described in Column 1? (In answering, assume conditions of no substantial surplus or shortage of qualified workers.)

☐ YES ☐ NO

2. If your answer to question #1 was no, state briefly the basis for your decision.

_____

_____

_____

_____

3. If additional training is required to qualify a worker performing the duties in Column 1 to perform the duties in Column 2, which one or combination of the following best describes the necessary training?

a. No additional training required ☐
b. Informal on-the-job training ☐ How long?_____
c. Formal company training course ☐ How long?_____
d. Vocational school training course ☐ How long?_____
e. Other training (explain)_____

_____

_____

4. What is your current total employment at this establishment?_____
(include employees in all occupations)

5. Of the total employment given above, please enter in the spaces below your best estimates of the numbers of workers you have identified as performing the duties described in Column 2.

Total currently employed	Estimated number by 1970	Estimated number by 1975

6. What are your current wage rates for workers performing duties in Column 2?

_____ to _____
beginning rate highest rate

Note: Any information given in this questionnaire is confidential, and does not in any way imply a commitment to consider any individual for employment.

PLEASE USE THE ENCLOSED ENVELOPE, WHICH NEEDS NO POSTAGE, TO RETURN THIS FORM

DE 6052 (11-66)